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THE
AMERICAN CYCLOPÆDIA.

VOL. XI.
MAGNETISM—MOTRIL.

De Graaf

THE

AMERICAN CYCLOPÆDIA:

A

Popular Dictionary

OF

GENERAL KNOWLEDGE.

EDITED BY
GEORGE RIPLEY AND CHARLES A. DANA.

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THE

AMERICAN CYCLOPÆDIA.

MAGNETISM

MAGNETISM, the name given to the phenomena displayed by magnets. If a bar of slightly tempered steel be held vertically and struck several blows with a wooden mallet, it will acquire the property of attracting iron filings at its two extremities. The same property may be communicated from one bar of steel to any number of similar bars, by rubbing one half of the length of each of the latter with the end of the former which was toward the earth in the experiment above mentioned, and the remaining half with the other end of the same bar. In this process a remarkable fact becomes evident, namely, that the bar which is employed to impart the magnetic property loses none of its own power; on the contrary, if the process is properly performed, it will become stronger; and hence we deduce the conclusion, that in magnetization there is no transfer of any substance from one body to another, but the development of a latent principle. If a magnetized bar be suspended by a fibre of untwisted silk, in such a manner as to have perfect freedom of motion, it will assume a N. and S. direction; that is, it will exhibit the phenomena called polarity. If to either end of a magnetized bar thus suspended a piece of soft iron be approached, attraction will be exhibited between them; when a similar bar is rolled in iron filings, the latter will be found to adhere in thick clusters at the two ends or poles, while none will attach themselves to the middle of the bar. If, instead of presenting to the suspended magnet pieces of soft iron, we bring near to its two ends in succession the two poles of another magnetized bar, repulsion as well as attraction will be exhibited; and by an attentive study of the phenomena we shall find that similarly magnetized ends repel, and dissimilarly magnetized ends attract each other. These forces act at great distances, through all interposed bodies,

and like gravitation diminish in intensity with the square of the distance from each pole. If a number of bars of soft iron be placed near each other in the same straight line, and the N. end, for example, of a strongly magnetized steel bar be brought near one end of the series, each piece of iron will become magnetic and exhibit polarity. The near end of the first magnet will be a S. pole, the far end a N. pole, and so on throughout the series, as follows:

S. N. S. N. S. N. S. N. S. N. S. N.

When the magnet is removed, the polarity of the iron bars ceases; and when the pole of the developing magnet is reversed, the polarity of the whole series is also reversed. The development of magnetism in this way is called induction, and by it we are enabled to explain many facts which would be otherwise perplexing. In accordance with this principle, we can assert that a magnet does not attract soft iron in its natural state, but that it first renders the metal magnetic, and then the attraction takes place between the dissimilar poles of two magnets. Again, when we sprinkle iron filings on a paper placed over a magnetic bar, they arrange themselves in beautiful curves radiating from each pole and joining near the equator of the bar. These lines result from the fact that each particle of iron becomes by induction a separate magnet, and attracts the adjacent filings, their arrangement in this case being the same as that of a series of small needles when under the influence of the two poles of a magnetic bar. The induction takes place readily in soft iron, and disappears as soon as the inducing magnet is removed, but not so with hardened steel; though the effect is less powerful in this, the polarity is permanent.—The method of making steel magnets of great power, which we have found from long experience the sim-

plest and most efficient, is as follows: Procure say ten flat bars of good steel bent into the usual form of a horse shoe; let these be well hardened and fitted with their flat sides together so as to form a compound magnet. Each of the members of this bundle may be magnetized separately to a small degree by supporting one of the legs on the lower end of a long rod of iron held nearly perpendicular in this latitude, and the other leg on the upper end of the same rod; or by rubbing one leg with the N. pole of a magnetized bar and the other with the S. pole. The several shoes, or bars, being in this way feebly magnetized, eight of them are joined together with their similar poles in contact, forming a compound magnet with which the remaining two bars are to be magnetized to a higher degree. For this purpose the latter are placed on a table on their flat sides, the N. pole of the one in contact with the S. pole of the other, so as to form a closed circuit; on any part of this circuit the compound horse shoe is placed perpendicular to the plane of the table, with its N. pole in the direction of the S. pole of the bar or shoe on which it rests, and then caused to slide in either direction entirely around the circuit, care being taken to retain its perpendicularity. After having gone over the surface of the two shoes in this way several times, they are turned over without separating their ends, and the process is repeated on the side which was previously under. By this method the two bars will receive a magnetic power nearly equal to the sum of the powers of the eight magnets in the bundle. Next these two bars are placed in the bundle, and two others are taken out and subjected to the same process. These in turn are put into the bundle, and two others are taken out and rubbed in the same way, until each pair of bars has been gone over two or three times in succession. By this method, with the most feeble beginning, the magnetism of the several shoes may be developed to their full capacity, and a magnetic battery produced of great power. A compound horse shoe of this kind is the most convenient instrument for magnetizing straight bars of hardened steel for practical uses. Suppose, for example, we wish to magnetize four bars, each 16 inches long, an inch wide, and an eighth of an inch thick; these are placed on their flat sides in the form of a rectangular parallelogram with their ends in contact; the compound horse shoe is then placed perpendicularly on the middle of one of the bars, and slid entirely around the parallelogram several times in succession; each bar is then turned over in its place so as to bring its lower side upward, and the process repeated, care being taken to keep the horse shoe perpendicular to the plane of the parallelogram, and its poles in the same relative positions to those of the bars. By this method, if the compound horse shoe is sufficiently powerful, the four bars can be magnetized to saturation

in the course of a few minutes. If there are but two bars to be magnetized, the parallelogram is completed by joining the ends of these with two similar bars of soft iron, and the same process of rubbing performed as before.—We have seen, in the article *ELECTRO-MAGNETISM*, that the most powerful magnetic induction is produced in soft iron by transmitting around a bar of this metal a current of galvanism, and that temporary magnets of great power can be produced in this way. The same method affords the readiest means of strongly magnetizing steel bars. Whatever may be the nature of the change which takes place in iron at the moment of magnetization, we are certain that it pertains to the atoms or molecules of the body, and not to the assemblage of these as a whole. To be convinced of this, it is only necessary to magnetize a steel rod, for example a thick knitting needle, the polarity of which will be exhibited near its two ends, while no attraction will be manifested near the middle. If however we break this into two pieces, we shall find each half is a perfect magnet; the separated ends which were previously joined together in the middle of the whole length will now exhibit polarity. If each of these pieces be again broken in two, we shall have four perfect magnets; and however frequent the division or small the parts into which the needle is divided, each part will still exhibit a N. and S. pole. We may continue, at least in thought, this division, and we have no reason to doubt that however far it might be carried, the same result would be produced. We infer from this experiment that the reason why the middle of a bar exhibits no magnetism is not that none really exists there, but that it is neutralized by opposite polarities. We are also certain that magnetization is attended with at least a momentary motion of the atoms of the iron. This is proved by the fact that during the sudden magnetization of a bar of iron, by means of a current of electricity transmitted through a spiral conductor enclosing the bar, a sound is emitted; and if the bar be rapidly magnetized and demagnetized by an interruption of the current, a musical sound will be produced. This fact was first noted by Dr. Page of the United States, and subsequently experimented upon by De la Rive, Becquerel, and others in Europe. The fact that a change takes place in the molecules is also rendered evident by an experiment of Mr. Joule of Manchester, England, in which he found that, although the whole capacity of the iron bar did not change on being magnetized, yet its dimensions varied, its length being increased and its width correspondingly diminished. That the magnetic force resides on or very near the surface of a magnet has been shown by Jamin, who finds that for every magnet there is a certain relation between the quantity of magnetism and the solid superficial contents, such as to establish a limit beyond which a given bar cannot exert magnetic

power. (See *Comptes rendus*, Paris, June, 1874.) Again, in the magnetization of iron, it is found that time is required to produce a full effect, as if it were necessary that inertia should be overcome; and Mr. Grove has shown that, in rapidly changing the polarity of a bar by means of an alternating current of electricity, the iron increases in temperature. The fact that a magnet heated to a white heat permanently loses its magnetism is well known; and in general the magnetism is diminished by any elevation of temperature. Dr. Maggic of Verona asserts that a circular plate of homogeneous iron, when magnetized, conducts heat better in a direction perpendicular to the line joining the poles than in the direction of this line itself. It is also stated that iron strongly magnetized resists the action of the file in a greater degree than in its ordinary state.—It was formerly supposed that magnetism could be developed only in iron, nickel, and cobalt; but we now know from the researches of Faraday, that all bodies exhibit signs of an inductive influence, provided the magnetic power applied be sufficiently great. From the results of his experiments, Faraday was led to divide all bodies into two great classes: those like iron, nickel, and cobalt, which, on being suspended between the poles of an electro-magnet, assume an axial direction, were denominated magnetic bodies, or paramagnetic; while those which arrange themselves at right angles to the magnetic meridian were denominated diamagnetic. (See DIAMAGNETISM.) The following series exhibits some of the last results obtained by Faraday on the magnetic and diamagnetic powers of bodies, in which the angle of torsion necessary to balance the force of a magnet expresses the power of the various substances, volume for volume, + representing the paramagnetic bodies, and — the diamagnetic: proto-ammoniate of copper, +134.23°; oxygen, +17.5°; air, +3.4°; nitrogen, +0.3°; carbonic acid gas, 0.0°; hydrogen, —0.1°; glass, —18.2°; pure zinc, —74.6°; alcohol, —78.7°; wax, —86.73°; nitric acid, —87.96°; water, —96.6°; sulphuric acid, —104.47°; sulphur, —118°; bismuth, —1967.6°. Faraday discovered another remarkable evidence of the action of magnetism on liquids and solids, as manifest in the effect produced on a polarized beam of light. Let a piece of gas pipe 18 inches long be closed at each end with a plate of tourmaline and filled with water. Let the axes of the tourmalines be placed transversely, so that the polarized beam of light which passes through the first may not be transmitted through the second. If while the apparatus is in this condition the iron be magnetized by a current of electricity passing through a long wire helix surrounding the tube, the beam of light will be partially transmitted by the second tourmaline. It is evident from this result that the magnetization of the iron has produced an effect on the particles of the liquid,

which has enabled them to react on the polarized beam of light and to produce as it were a twist in its plane of polarization. A similar result will be produced if the liquid be contained in a tube of glass or any other substance, and placed between the poles of a powerful magnet. To observe the effect however in this case, the poles of the magnet should be perforated for the transmission of the light. A similar effect is produced upon solid transparent bodies, and particularly upon heavy glass of the silicio-borate of lead. The phenomena of magnetism admit of being investigated quantitatively and mathematically without adopting any particular ideas as to the fundamental nature of this force; the most complete investigations of this kind have been those of J. Clerk Maxwell (*"Treatise on Electricity and Magnetism,"* Oxford, 1873), who has been able thus to show the profound significance of Faraday's lines of force, and to make some progress in the reduction of this study to a dynamical science. Quite recently Bichat has published a very extended experimental investigation of this subject, and among other things has established the fact that the power of this magnetic influence diminishes as the temperature rises. Faraday also discovered the fact that crystallization exerts a considerable influence upon the direction of crystallized bodies placed between the poles of a powerful electro-magnet; Plucker found that the axis of crystallization tended to assume the axial or equatorial direction; and Tyndall and Knoblauch established the fact that if the molecules of any body are more condensed in one direction than in any other, the magnetism will act along this direction with greatest intensity. If the substance is paramagnetic, the line of greatest condensation will assume an axial position; if diamagnetic, the same line will come into a state of rest in the equator. This is shown by mixing carbonate of iron with gum into a stiff paste, a disk of which being compressed between the fingers, so as to give a greater density in one direction, and afterward suspended between the poles of a powerful electro-magnet, will settle with its line of greatest condensation in the axial direction. If a similar experiment be made with a compound of powdered bismuth and gum, the line of greatest condensation of this factitious substance will assume an equatorial position.—Various attempts have been made to show a direct magnetizing influence in the solar beam to develop magnetism in soft iron needles, and it has even been asserted that the direct radiation from the moon has a powerful disturbing effect upon the needle of the mariner's compass; but the most delicate experiments made by those best qualified for such investigations have failed to exhibit any result of this kind.

MAGNETISM, Animal. See ANIMAL MAGNETISM.

MAGNETISM, Terrestrial. Gilbert in 1600 was the first to announce the bold hypothesis that

the earth is a great magnet, and that the needle assumes a N. and S. direction because it is attracted by the dissimilar and repelled by the similar poles of the terrestrial sphere. He illustrated this hypothesis by magnetizing small globes of steel; but this illustration, though it served in a general way to represent the phenomena, is not strictly correct. In the first place, the magnetism of the earth is not symmetrical like that of a steel magnet, but is to a considerable degree irregular; and secondly, it is not permanent, but subject within certain limits to almost continual changes both in direction and intensity. Indeed, the magnetic needle is scarcely ever absolutely stationary from one moment to another, but is constantly exhibiting minute variations. If the earth is a magnet, the free needle at any place should assume a definite direction; but it does not follow from the hypothesis that this direction must be the true north and south, since the magnetic poles of the earth do not necessarily coincide with its geographical poles. If the two poles be in the same meridian with a given place, the needle will at that place point to the true north; but if the magnetic pole lie either W. or E. of the meridian of a given place, the N. end of the needle will deviate either E. or W. of the true north, and the phenomenon of the declination or variation of the compass will be exhibited. That the needle does not point to the true north had long been known, and it was observed by Columbus in his first voyage of discovery that the direction of the needle is not the same for all portions of the earth. Thousands of observations have since been made to obtain the data for constructing charts to represent for the use of the mariner the declination in various parts of the earth. Again, if we assume that the earth is a great magnet, it will follow that in passing from the magnetic equator, the needle which is accurately balanced, so as to settle horizontally at the former place, will incline or dip as we advance to either pole. That this is really the fact was first discovered by Robert Norman in 1576. Furthermore, if the earth is a magnet, we should expect that the magnetic intensity or the strength of the action would not be the same at all points of its surface, and this inference has also been found to be true. By counting the vibrations of a delicate dipping needle, we find that the strength of the magnetism of the globe increases as we go from the equator toward the pole. The magnetic intensity, however, exhibited by observations of this kind, does not indicate as rapid an increase of force as we approach the magnetic pole as might be expected from such a distribution of magnetism as would result from a magnetized sphere of iron. In conformity with the three magnetic elements we have mentioned, namely, the variation, the dip, and the intensity, it is customary to represent the magnetic condition of the earth at a given time by three systems of lines supposed to be drawn on the surface of

the globe. These are as follows: 1, the line drawn through all places where the needle points to the true north or south, to 5° W., to 5° E., 10° W. and 10° E., and so on, called the isogonic lines, or lines of equal variation or declination; 2, lines nearly at right angles to the former, drawn through all places exhibiting the same angle of dip of the needle, called isoclinical lines; and 3, a system of lines joining all places having the same magnetic intensity, and consequently known by the name of isodynamic lines. It is a problem of much practical importance in regard to the art of navigation, as well as to the study of the phenomena of terrestrial magnetism, that these three systems of lines should be accurately determined; and accordingly expeditions have been fitted out by different nations almost expressly for this purpose. All the observations, however, which have been made in regard to them, indicate the fact that they are not permanent, but are constantly undergoing a change, of which the law is exceedingly complex. Halley's chart of declination for 1700 is very different from that of Barlow for 1833; and Hansteen's dip chart for 1780 does not represent the isoclinical lines of the present day. The great practical object then of investigation in this branch of science is to discover the law of these changes, in order that, the position and form of these lines being determined for a given epoch, they may be calculated for any future time. The phenomena were first referred to a very small magnet at the centre of the earth, the direction of which is subject to irregular changes. Tobias Mayer, instead of supposing a magnet to be placed at the centre of the earth, conceived one to be situated at about the seventh part of the earth's radius from the centre, and from this hypothesis he was enabled to calculate the variation and dip in places not far distant from those in which these quantities had been determined by actual observation. Hansteen of Norway, who collected an immense number of observations, endeavored to represent the phenomena by the hypothesis of two small eccentric magnets of unequal strength placed at the centre of the earth, giving rise to four magnetic poles, two in each hemisphere. In order to represent the variations of the needle, the poles of each of these two magnets were supposed to perform a revolution around an intermediate line, with different velocities. Gauss of Göttingen, however, made the first rigid investigation of the problem in accordance with a definite plan. He founded his research on the assumption that the terrestrial magnetic force, or that which is exerted on a needle freely suspended by its centre of gravity, is the resultant action of all the magnetized particles of the earth's mass. According to this assumption, the governing power which affects the needle is due to the magnetism of the earth itself, while the different perturbations to which the needle is subjected are the results of extraneous forces.

To give clearness of perception, he represents magnetization as consisting in the separation of two magnetic fluids, giving magnetic polarity to each particle, or in other words in a repulsive and attractive force acting inversely as the square of the distance. No change would be produced in the result by adopting the hypothesis of Ampère, in which magnetism is held to consist of constant magnetic currents; nor would there be any difference if terrestrial magnetism were ascribed to a mixed origin, as consisting partly of actual electrical currents and partly of permanently magnetized masses. Starting from these assumptions, Gauss obtained a general mathematical expression for the action of the whole globe on a magnetic needle, however irregular might be the distribution of the magnetism of the former. In other words, he obtained an expression by which, if the distribution of the magnetism of the earth were known, and the intensity of its action ascertained with reference to a unit of distance and intensity, the position of the needle and the magnetic force by which it was acted upon at any point could be determined; and conversely, if the action of the earth on the needle were known for a large number of places on the surface of the earth, the distribution of the magnetism might be considered the unknown quantity, and might be approximately found from the data thus afforded by observation. In this way Gauss was enabled to give a method of constructing general charts to represent in every part of the earth the magnetic declination, inclination, and isodynamic lines, the intensity and direction of the magnetic force being known at a given number of places. The data necessary for improved charts of this kind have been furnished by the magnetic surveys made in various parts of the world in recent times, at the suggestion and principally under the direction of the British association. By repeating the construction of such charts for different epochs, the secular changes in different parts of the earth will become known; and it is hoped that, in due time, if the system of magnetic observations which has been established should be continued, the law of the changes will ultimately be fully ascertained. The investigations of Gauss have shown that the hypothesis of two movable magnets at the centre of the earth does not explain the phenomena of terrestrial magnetism. He defines a magnetic pole to be the place at which the needle points directly downward, or at which the dip is 90° . Indeed, he has pointed out the very obvious fact, that if there be two such points in the northern hemisphere, then there must be somewhere between the two a third point at which the needle would also assume the vertical position. Gauss, however, arrives at the remarkable conclusion that the place of greatest magnetic intensity does not coincide with that which is usually denominated the pole; and it would appear that there may be a diffused space in the northern

hemisphere around which the isodynamic lines may be drawn, representing apparently at least two centres of greater magnetic attraction. These phenomena are best represented by the hypothesis of magnetism due to currents of electricity in the earth, but as yet no definite hypothesis has been advanced as to the nature of such currents. It is true, they have been referred to thermo-electricity; but how the varying heat of the sun or the high temperature of the interior can give rise to currents constantly circulating round the earth, of such intensity and such flexures as would account for the observed direction and intensity of terrestrial magnetism, has not yet even approximately been made out.—What we have said in regard to the magnetism of the earth principally relates to its state at a particular time. We shall now briefly give an account of the discoveries which have been made in regard to the changes to which terrestrial magnetism is subject; and for the data from which these have been deduced science is indebted to the several magnetic observatories established in different parts of the earth. These are furnished with improved instruments, which in their present perfect state constantly record, by means of photography, the minutest changes in intensity and direction of the magnetic force. The magnetic perturbations were at first supposed to consist of two classes, namely, periodical and fitful. Many perturbations, however, which had been regarded as fitful are now known to recur at regular periods, and are therefore not properly designated by this term. The changes of terrestrial magnetism are of three classes. The first consists in a movement of the magnetic poles, around the true poles of the earth, from E. to W. in both hemispheres. This motion is inferred from the secular changes which have been found to affect the position of the magnetic lines, as well as from the secular changes in the position of the magnetic needle at any given station. The magnetic lines at any given epoch present great irregularity of shape, because very slight differences of magnetic declination, due to local peculiarities, may largely affect the position of the magnetic lines. But when the changes of declination at any given station are considered, they are found to correspond, at least during the period within which systematic observations have been made, to an oscillation such as would result from the motion of the magnetic poles around the true poles of the earth in a period of between six and seven centuries. Thus in 1576 the declination needle in London pointed $11^\circ 15'$ E.; in 1657 or thereabouts the needle pointed due N.; in 1760 it pointed W. by $19^\circ 30'$. The westerly declination attained its maximum in 1819, when it amounted to $24\frac{1}{2}^\circ$. Since then the needle has been slowly travelling eastward, the present annual rate of decrease being more than $8'$. The mean westerly declination for the year 1873 was $19^\circ 30'$. Again,

in Paris, which lies $2^{\circ} 20' E.$ of London, the needle pointed due N. in 1663. Its subsequent motions have closely resembled those of the London needle; but the Paris needle ceased to move westward as early as 1817, and attained a maximum declination of only $22\frac{1}{2}^{\circ}$. Now if we combine these facts with the changes of the inclination, we see at once that they point to a movement of the northern magnetic pole from a position between London and the N. pole in the middle of the 17th century to its present position in the extreme north of the American continent (or rather in the archipelago which lies beyond those parts northward). For in the middle of the 17th century the needle pointed northward, while afterward it pointed westward. Then the magnetic pole lay at that time either directly beyond the N. pole of the earth, or somewhere on (or near) the arc joining London and the N. pole. But if the magnetic pole had lain beyond the true pole, the inclination would have been much less than that corresponding to a magnetic pole at the true pole of the earth, that is, less than $51\frac{1}{2}^{\circ}$. Instead of this, however, the inclination was much greater. Moreover, the inclination, which would then have been at a minimum had the magnetic pole been beyond the true pole, appears to have then been at a maximum. For though exact observations of the inclination have not been made during so many years as observations of the declination, we find that in 1720 the inclination was $74^{\circ} 42'$ in London; in 1800, $70^{\circ} 35'$; in 1865, $68^{\circ} 9'$; in 1870, $67^{\circ} 55'$; and in 1873, $67^{\circ} 45'$. The northern magnetic pole was therefore between London and the N. pole of the earth in the middle of the 17th century, and has since travelled westward, or in a direction from E. to W. around the true pole. If we assume the motion to be uniform (which is probably not the case), and that the needle at Greenwich responds uniformly to such motion (which is certainly not the case), we may calculate the period of polar revolution. Thus, taking the magnetic pole as due N. in 1657, and in 1833, according to Ross's observations, as $95^{\circ} W.$ of Greenwich, we have for the period of revolution $\frac{360}{95}(1833-1657)$ years = 667 years about.

Combining Ross's estimate with the Paris epoch, we get a period of $\frac{360}{95}(1833-1663)$ years = 644 years about. We may take 650 years as a not improbable period of revolution. It may be added, as confirming the above, that in Russia the magnetic inclination has now reached a minimum, while in Peking it is increasing. The cause of this change is at present entirely unknown; it has no analogy with any other class of physical phenomena with which we are acquainted. By a rough comparison of the isothermal lines and the lines of equal magnetic intensity, a general similarity has been observed, and hence the two have been considered as referable to the same cause;

but it will be perceived that this analogy does not hold, since the magnetic lines are in constant motion, while the isothermal lines retain very nearly a fixed position, or at least change in comparison with the other lines with extreme slowness.—The second system of changes has evident relation to the annual position of the earth in its orbit round the sun, and its revolution on its axis. These were at first ascribed to the influence of the heat of the sun on different parts of the earth; but they have the remarkable characteristic of exhibiting notably the same amount in the southern hemisphere as in the northern, and in the tropical as in the temperate zones. The magnetic force is found to be greater in the months of December, January, and February, when the sun is nearest to the earth, than in those of May, June, and July, when it is most distant from it; whereas, were the effect due to temperature, the two hemispheres would be oppositely instead of similarly affected in each of these two periods. We must therefore ascribe the effect to the direct magnetism of the sun itself, and consider it established that this luminary like the earth possesses attracting and repelling poles, and that the effects on the needle result from the different positions of the earth in regard to these centres of action. The pole of the needle which is least distant from the sun makes a double diurnal movement in the following manner. It arrives at its greatest western excursion four or five hours before the sun passes the meridian of the place, as if it were repelled; it then turns eastward with increasing celerity, and reaches the limit of its eastern excursion one or two hours after that passage. As the sun passes the inferior meridian, there is repeated in the night the same variation as that which took place in the day. To illustrate the action, let us suppose two globes, a larger and a smaller, placed upon the same plane, with their axes of revolution not precisely parallel to each other, as in the case of the earth and the sun; and let us further suppose that one globe is made to revolve round the other, the axis of the former being constantly parallel to itself. It is evident that in one half of the orbit of the moving globe the northern poles will be inclined toward each other, while in the other half of the orbit the southern poles will be similarly inclined; and if we further suppose that the magnetic axis of the sun, as in the case of the earth, does not differ very much from the axis of rotation, we shall have an explanation of the effects observed in the records of the diurnal motions of the needle. The N. end of the needle, which is attracted by the N. pole of the earth, will be repelled by the N. pole of the sun, provided it has dissimilar magnetism to that of the earth, and consequently will decline from the sun; and as, on account of the revolution of the earth on its axis, this luminary appears on the E. of every place in the northern hemisphere in the morning and on

the W. side in the afternoon, corresponding variations in the needle will be exhibited. In the other half of the year, for a similar reason, the S. end of the needle will be affected in an analogous but opposite manner; the strength of the magnetism of the earth will be increased by the nearer approach of the sun, in the same way that two magnets having their dissimilar poles opposite each other are increased or diminished in magnetic power by a diminution or decrease of distance. We are indebted for the interesting discovery of the polar action of the sun to Gen. Sabine of England, who has had charge of the reduction of all the magnetic observations of the English colonial observatories; and to Dr. Kriel of Austria for another of the same character, which leads us to extend the principle of magnetism to the moon. It is found that there is a variation of each of the magnetic elements corresponding with the diurnal position of the moon in regard to the earth; but this resembles the tides in exhibiting two maxima and two minima in the course of 24 hours, regularly changing in time with the motion of the moon in her orbit around the earth. These phenomena indicate that the moon is not magnetic *per se*, that is, possessed of permanent magnetism, but its magnetic condition resembles that of soft iron developed by the continued but varying inductive influence on account of change of distance of the earth and the sun. That these changes in the magnetic elements cannot be due to heat in this case, must be evident, since the temperature of the moon as a mass is but little greater than that of celestial space.—The third class of variations, which was formerly denominated fitful, is now known in a certain sense to be periodical. They were called by Humboldt magnetic storms, and were found by Arago to accompany the appearance of the aurora borealis. Although it is impossible to predict from our present knowledge the recurrence of individual cases of these great perturbations in the intensity and direction of the magnetism of the earth, yet they are known to increase in number and magnitude of action within the period of a little more than five years, and gradually to diminish through nearly an equal period, the whole cycle being completed in a little more than 11 years. The magnetic storms have been observed in the most distant parts of the earth, and no doubt can now exist as to their cosmical character. The lunar influence of which we have just spoken does not appear to participate in or be connected with this inequality. The periodicity of these apparently fitful variations of magnetism was first pointed out by Gen. Sabine, and has since been established by the investigations of Prof. Lloyd of Ireland, Dr. Lamont of Germany, and by those of Prof. Bache from the observations made under his direction at Girard college. But the most astonishing result in regard to this class of perturbations is that they coincide with the periodical

recurrence of the maxima and minima of the spots on the sun. A German astronomer, Schwabe, has established, by nearly 30 years of unremitting daily observation, the periodicity of this phenomenon. He finds that the solar spots increase in magnitude for about $5\frac{1}{2}$ years, and diminish through an equal period, the cycle, as in the case of magnetic storms, being completed in about 11 years. The discovery of a connection of this remarkable kind gives to magnetism a high position in the scale of distinct natural forces, and assigns to it equally with gravitation a truly cosmical character. It is not impossible that the spots on the sun may be connected with the falling into its gaseous envelope of meteorites, and this suggestion is favored by an observation of Mr. Carrington of England, in which a remarkable appearance was observed on the surface of the sun, analogous to that which would have been produced by an occurrence of the kind we have mentioned. Recently Prof. Loomis of Yale college has published his analysis of the observations of many past years, apparently placing beyond all question the existence of a connection between the sun-spot period, terrestrial magnetic disturbances, and the frequency of auroras. One of the most interesting questions belonging to the future of this subject, is the possible existence of an association between the phenomena of the sun's colored prominences and the magnetic activity of the earth. Observations by Prof. Young of Dartmouth college seem to show the extreme probability of such an association. Moreover, the observations which have been made on the prominences, by showing a connection between these objects and the solar spots, seem to force upon us the conclusion that some relation exists between the colored flames and the phenomena of terrestrial magnetism, since the partial dependence of these upon the sun's condition as to spots has been very nearly if not quite demonstrated.—It is not intended by what has been said to convey the idea that meteorological changes may not affect the position of the needle, and that even the magnetic condition of the atmosphere, according to the hypothesis of Faraday, may not produce appreciable results; but as yet the actions of these appear to neutralize each other, and to leave no definite record of their existence in the course of periods of considerable length. It is probable, however, that with the improved photometrical instruments and a more minute scrutiny of their records, the effects due to these causes will be shown. Since the agitation of the atoms of an iron bar is found to favor the development of magnetism by induction, it is not improbable that the magnetism of the earth may be disturbed during the continuance and shortly after the occurrence of an earthquake.

MAGNETO-ELECTRICITY. As shown in the article **ELECTRO-MAGNETISM**, great magnetic power is developed by passing a current of

galvanism around a bar of soft iron; and since in all cases a mechanical action is accompanied by an equal amount of reaction, it is reasonable to suppose that electricity ought to be evolved by magnetism. Various fruitless attempts were however made to obtain this result; the form in which the effect was to appear was unknown, and it was not till 1831 that Faraday succeeded in exhibiting currents of electricity in a wire by means of magnetic reaction. It has also been stated in the same article that, in accordance with the theory of Ampère, all the mechanical properties of an ordinary magnet may be exhibited by currents of electricity transmitted through spiral conductors; and hence, in order to present the phenomena of this class in the simplest form, we shall begin with stating the fundamental facts of what is called electro-dynamic induction, or electricity induced by a galvanic current. 1. Let a portion of a copper wire be extended in a straight line horizontally, and the two ends at a distance be connected with a galvanometer so as to form a closed circuit in which a current may be induced. Let also a portion of another wire, connected with a galvanic battery, be placed parallel to the first, and a current sent through it. If the wire transmitting the battery current be suddenly brought near the wire connected with the galvanometer, during the approach of the second wire toward the first a current of the natural electricity of the latter will pass through the galvanometer in a direction adverse to that of the inducing current. 2. The induced current continues only during the motion of the inducing conductor; when the motion of this is stopped, the induced current ceases, and while the current of the battery remains stationary and continues the same in quantity and intensity, no perceptible effect is exhibited in the adjoining wire. 3. When the inducing current is suddenly moved away from the first wire, a current is observed to pass through the galvanometer in the opposite direction to the former induced current, or in the same direction as the battery current. 4. Let the two wires be placed parallel and near to each other, while the circuit of the battery current is interrupted. If in this condition the current from the battery be suddenly established through the inducing conductor, an induced current of electricity will pass through the galvanometer in a direction adverse to that of the battery current; or in other words, the effect will be the same as that of the approach of the battery current to the inducing wire, as in case 1. 5. During the continuance of the battery current of unimpaired strength and intensity, no disturbance of the natural electricity of the adjoining wire is perceived; but at the moment the current of the battery is stopped by a rupture of the circuit, a current passes through the galvanometer in the same direction as that of the current of the battery. All these phenomena are in accordance with the hypothesis that during the transmission of

a current of electricity through a wire, there is exerted in space on every side an inductive action diminishing with the distance which disturbs the natural electricity of any conducting matter which may be brought within its influence; that while the conductor remains at rest within this influence an abnormal equilibrium exists; and when the conductor is removed from this influence, or when the latter ceases, the usual equilibrium is established by a reverse motion. Since, according to the theory of Ampère, magnetism consists of currents of electricity revolving at right angles to the length of the magnetized bar, it follows that analogous results ought to be produced by magnetism; and for this purpose, instead of the battery current in the last series of experiments, let there be substituted a magnetized bar held at right angles to the wire connected with the galvanometer. 1. If this bar be suddenly brought down upon the wire perpendicular to its length, the galvanometer will indicate a current in an opposite direction to the hypothetical current in the lower side of the magnet. If the wire be E. and W. and the magnet be held across it with its N. pole toward the north, the current in the lower side of the magnet will be from the E. to the W., while the induced current will be in an opposite direction, *i. e.*, from W. to E. 2. When the motion of the magnet toward the wire is stopped, the induced current ceases, and no sign of electricity is exhibited so long as the magnet remains at rest. 3. When the magnet is suddenly removed from its proximity to the wire, a current in the opposite direction to that of the first, that is, in the same direction as the current in the lower side of the magnet, is indicated by the galvanometer. 4. When a bar of soft iron is placed across the wire at right angles, and this is suddenly magnetized, either by a galvanic current or by touching its ends to the poles of a horseshoe magnet, a momentary current is produced in the wire in a direction opposite to that of the hypothetical currents of the near side of the magnet. 5. So long as the soft iron bar remains at rest and its magnetism suffers no change, no current is indicated by the galvanometer; but the moment the bar is unmagnetized a reverse current takes place. The two series of results we have given above are precisely analogous; the latter being merely a case of the former, in which the hypothetical currents of the magnet are substituted for the real current of the battery.—All the effects that we have described are produced with much more intensity, when, instead of using extended wires parallel to each other, we employ wires in the form of spirals, either flat or cylindrical. For example, to obtain an induced current of considerable intensity by means of magnetism, we place on a rod of iron, say four inches long, a spool of long wire covered with silk, which may occupy two inches of the length of the middle of the iron. If the two ends of this rod projecting beyond the spool

be suddenly brought into contact with the two poles of a horse-shoe magnet, an induced current will be developed for a moment in the surrounding wire; and when the same rod is suddenly detached from the poles, a current in an opposite direction will take place; and in this way a continued series of alternate currents may be developed by alternately making and severing the contact of the poles of the magnet and the ends of the rod. A still greater effect may be produced by causing the rod to revolve on an axis at right angles to the middle of its length, before the poles of the magnet, so that each end in rapid succession may be brought in contact first with the N. and then with the S. pole, and so on.—Shortly after the discovery by Faraday of the laws we have stated, Mr. Joseph Saxton of this country, then a temporary resident of London, afterward attached to the United States coast survey, invented (1832) the first machine for giving sparks and shocks in accordance with the arrangement we have just described. Instead of a single bobbin of wire on the middle of a straight bar, he employed two, one on each leg of a bar of soft iron bent into the form of a horse shoe, which were made rapidly to revolve by means of a multiplying wheel before the poles of a magnet. At each half revolution the magnetism of the soft iron was entirely reversed, and in this way a series of currents was induced, of sufficient intensity to decompose water, fire combustible bodies, and powerfully to affect the nervous system. An instrument maker in London, who was employed to construct these machines, made a slight change in the arrangement, which principally consisted in placing the inducing horse-shoe magnet in a vertical position, and in causing the spools of wire to revolve in a plane parallel to its flat side, instead of parallel to its poles. This change, instead of improving the instrument, produced an opposite effect, since the strength of the induction was much diminished. The author of it, however, succeeded by advertisements, and an actual exhibition of it in France, in attaching his name to the invention, to the exclusion of that of Saxton. It is, however, gratifying to see that in the German works on the subject, and also in the better class of English publications, justice is done to the original inventor. The next important series of investigations on this subject, after the original discovery of Faraday, was by Professor Henry of Princeton, now secretary of the Smithsonian institution at Washington. He found that at the beginning and ending of the galvanic current in a long wire, an induced current was produced by an action which has sometimes been called the induction of a current on itself. To illustrate this, let the circuit of a small battery of a single element be closed by a short wire of about a foot in length, dipping into a cup of mercury. When the circuit is broken, no spark, or but a very feeble one, will be observed; but if we now substitute for the short

wire one of say 100 feet in length and of considerable thickness, a vivid spark will be exhibited when the circuit is interrupted. To obtain this result in the most striking manner, we should employ a copper ribbon at least an inch and a half wide and 100 ft. long, well covered with two thicknesses of silk, and rolled into the form of a flat spiral. At the rupture of a battery circuit of which this forms a part, a loud snap and deflagration of the metal will be produced, when with a short wire, the battery remaining the same, scarcely any but a very feeble spark would be observed. By this arrangement several spires of ribbon react on each other, and increase the effect. By coiling a bell wire covered with silk of .600 or 700 ft. in length into a spiral ring, the intensity will be so much increased that shocks may be obtained by means of a small galvanic battery of a single element. If the same wire be coiled into the form of an elongated spiral, and in the centre of this a rod of soft iron be placed, or what is better, a bundle of iron wire, the intensity is still more exalted. In this case the magnetic reaction is combined with that of the current of galvanism, and the two actions being in the same direction conspire to increase the effect. To produce, however, the most powerful inductive apparatus, a bundle of varnished iron wires of about 15 in. in length, and together forming a diameter of about an inch, is surrounded with a coil of thick copper wire well covered with silk of 300 or 400 ft. in length. Around this, but separated from it by a cylinder of glass or pasteboard soaked in shell lac, is coiled a fine copper wire of 4 or 5 m. in length, care being taken that each spire be well insulated from every other. When a current of galvanism from a battery of even a single element is transmitted through the thick copper wire which surrounds the inner core or bundle of iron wire, the latter becomes magnetic; and at the instant the rupture is made in the battery current, a sudden cessation of the magnetism, as well as that of the current itself, induces a current of great intensity, though of small quantity, in the outer surrounding fine wire. Each spire of the long wire in this arrangement is subjected to the inductive influence; and the rapidity of motion of the electricity of the wire, were it not for the increased resistance, would be in proportion to the number of spires, or in other words to the length of the wire. This apparatus has received various ingenious improvements, the principle in all cases remaining the same. Dr. Page was the first to invent an apparatus on this plan by which the rupture of the battery current was rendered automatic; the magnetization of the iron core caused the attraction of a small magnet attached to one end of a lever which broke the circuit, and the consequent disappearance of the same magnetism allowed the end of the lever to fall into a cup of mercury and thus again complete the circuit. This instrument was much enlarged

and improved by Ruhmkorff of Paris, and was still further perfected by an ingenious Ameri-

can thus be instantaneously generated, producing light, heat, or other effects in any locality

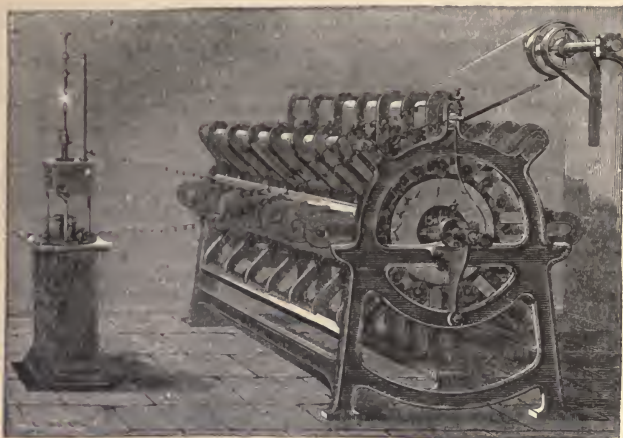


FIG. 1.—Lighthouse Machine.

can artisan, E. S. Ritchie of Boston. The essential desideratum in the construction of this instrument is the perfect insulation of the several spires of wire, so that the

intense electricity which is produced may not strike across from one spire to another; and Mr. Ritchie effected this by means of an ingenious process of winding, together with an improved insulation. An appreciable time is required to overcome the resistance of the wire and to give it a full charge of the current of electricity, and also to magnetize iron; hence in the instrument we have described, when a single battery is employed, the induced current, which gives the intense spark, is that which is produced at the rupture of the battery current. We can however increase the intensity at the beginning of the current, by employing a battery of a number of elements, which, producing electricity of greater intensity, more suddenly establishes the current in the wire, and more rapidly develops the magnetism of the iron.—The improvements that have been made of late in the construction of magneto-electric or induction machines have been so striking as to warrant the hope eventually derive great advantages from the powerful electric currents that

whither the conducting wires are led. The accompanying figures illustrate the forms of the most notable machines that have been constructed. The first is the machine constructed by the *compagnie d'alliance* of Paris on the plans of Clarke and Nollet. In Clarke's machine, which is but a slight modification of Saxton's, two soft iron cores, connected by copper and iron bars, revolve rapidly in front of the poles of a powerful horse-shoe magnet. Around these cores is coiled an insulated copper wire, whose ends are so connected with a "commutator" that

the alternating currents of electricity circulate always in the same direction through the external circuit. In the machines of the Alliance company the use of the commutator may be



FIG. 2.
Siemens's Armature.

that we shall eventually derive great advantages from the powerful electric currents that

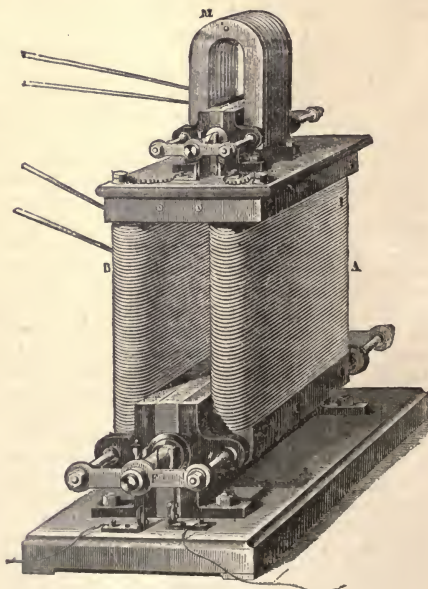


FIG. 3.—Wilde's Machine.

omitted if the currents are designed only for the production of light, since in this case the rapid reversals of the current are an advantage. In Siemens's machine, fig. 2, invented in 1854, a

peculiar core replaces the double iron armature of Saxton and Clarke; this is a long cylinder around which a wire is wound lengthwise. The cylinder is made to revolve rapidly between the opposite poles of a series of horse-shoe magnets; the perpetually reversing magnetism induced in the core by the magnets is carried in successive currents by the insulated wire coil to the commutator, and thence through the external circuit. In Wilde's machine, fig. 3, the external current from a small Siemens machine, M, is made to pass through a large coil, A B, enclosing a soft iron horse-shoe bar, which is thereby magnetized and acts as a permanent magnet on a second revolving core, F, larger than but similar to that of the smaller apparatus. The latter core collects a much more powerful current than that first produced, and this can be used to generate a third or higher order of current; but with each such increase of current we increase the power required to turn the cores; and though the heat and light are magnificent, yet in no case can we convert into electrical energy more than a certain per cent. of the mechanical energy consumed. In the machine devised by Ladd in 1867, as shown in fig. 4, a principle has been introduced suggested a short time previously by both Siemens and Wheatstone. Two plates of soft iron, B B', are so placed that if they possess the least initial magnetism, as is ordinarily the case, then the rotation of the Siemens armature, *a*', collects the currents, which are at once led into the coils about B and B', and thus elevate the original magnetism of the plates to a high degree of intensity. Between the opposite poles of the magnets rotates a second Siemens armature, *a*, which collects the

arms, R R, that as the ring rotates the induced current flows continuously from these arms to certain fixed metallic pieces in frictional contact with them, and thence to the external cir-

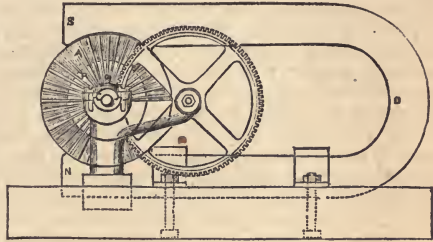


Fig. 5.—Gramme's Machine.

cuit. By dividing the current, one half may be led back to the exciting magnets, S O N, and be used to increase the power of the machine. The effect produced by these machines increases proportionately to the velocity of rotation up to an unknown limit; it also increases with the number of coils encircling the ring core. The machines of the Alliance company have been employed for illuminating purposes at some French lighthouses, and those of Wilde have been similarly employed in Great Britain. The Gramme machine has been used for the illumination of the Victoria tower in London, and in the galvanoplastic works of M. Christofle in Paris.—*Currents of different Orders.* An induced current, by its action on a third conductor, may produce another current, and this another, and so on. If we call the current of the battery a current of the first order, the first induced current is named that of the second order, and so on. The discovery and investigation of the principle and properties of currents of the different orders is mainly due to Prof. Henry. On reflecting a little, it will be evident that these currents cannot be produced immediately by placing several straight wires parallel to each other and passing a current of electricity through one of them; in this case the battery current would act on the surrounding wires, and simply produce in each of them an induced current of the second order. To obtain, therefore, currents of the different higher orders, we employ a number of flat spirals, through one of which placed horizontally on a table is transmitted the current from the battery. Immediately above this, and separated from it by a stratum of air or a plate of glass, is a second flat spiral, the ends of which are connected with a third

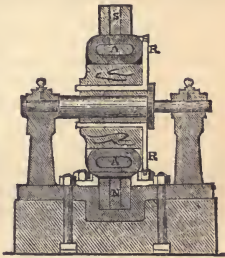


Fig. 6.—Gramme's Machine.

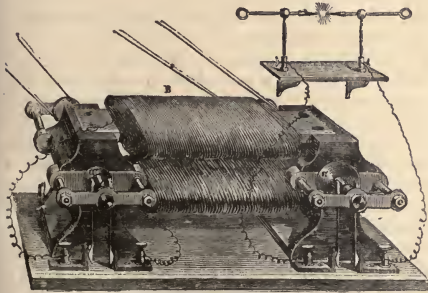


Fig. 4.—Ladd's Machine.

current for the external circuit. Gramme's machine, invented in 1871, two views of which are given in figs. 5 and 6, differs materially from its predecessors in that it offers a really continuous current instead of rapid alternations. This is effected by using a circular-ring of soft iron, A A, for the core in which the magnetism is to be induced. The coil of wire around the core offers a continuous metallic circuit, divided into numerous sections, the ends of the wires in each so connected with radial metallic

arms, R R, that as the ring rotates the induced current flows continuously from these arms to certain fixed metallic pieces in frictional contact with them, and thence to the external circuit. By dividing the current, one half may be led back to the exciting magnets, S O N, and be used to increase the power of the machine. The effect produced by these machines increases proportionately to the velocity of rotation up to an unknown limit; it also increases with the number of coils encircling the ring core. The machines of the Alliance company have been employed for illuminating purposes at some French lighthouses, and those of Wilde have been similarly employed in Great Britain. The Gramme machine has been used for the illumination of the Victoria tower in London, and in the galvanoplastic works of M. Christofle in Paris.—*Currents of different Orders.* An induced current, by its action on a third conductor, may produce another current, and this another, and so on. If we call the current of the battery a current of the first order, the first induced current is named that of the second order, and so on. The discovery and investigation of the principle and properties of currents of the different orders is mainly due to Prof. Henry. On reflecting a little, it will be evident that these currents cannot be produced immediately by placing several straight wires parallel to each other and passing a current of electricity through one of them; in this case the battery current would act on the surrounding wires, and simply produce in each of them an induced current of the second order. To obtain, therefore, currents of the different higher orders, we employ a number of flat spirals, through one of which placed horizontally on a table is transmitted the current from the battery. Immediately above this, and separated from it by a stratum of air or a plate of glass, is a second flat spiral, the ends of which are connected with a third

spiral placed at such a distance as to be entirely out of the influence of the battery current. Placing on the third a fourth (the two being separated as before by a plate of glass), and joining the ends of this with the ends of a fifth spiral, and so on, we shall have a series of successive currents. The current of the first order induced by the battery current induces a secondary current in the second spiral, which passes through the third spiral, and, thus free from the influence of the battery current, induces a current of the third order in the fourth spiral, which in turn, passing through the fifth spiral, induces a current of the fourth order in the sixth, and so on. Since each induced current must have a beginning and an ending, the current of the third order must in reality consist of two currents in immediate succession and in opposite directions, one produced at the beginning and the other at the ending; and for a similar reason a current of the fourth order must consist of four currents in immediate succession and opposite directions. On this account currents of the higher orders do not definitely deflect the needle of the galvanometer, but merely give it a slight tremor; the impulses in opposite directions follow each other so rapidly that the inertia of the needle is not overcome in the interval between the two. The existence therefore of currents of different higher orders could not be determined by the galvanometer; they however give intense shocks, and also permanently magnetize steel needles. This latter effect will be understood when it is recollected that, although the series of waves in different directions are the same in quantity, they differ very much in intensity; that at the beginning of the agitation they have much the greatest energy. Hence the currents of different orders exhibit dominant impulses in definite directions. If the direction of the battery current be represented by +, the current of the second order at the beginning of the battery current will be represented by —; the dominant current of the third order +, of the fourth —, and so on; while the series of dominant impulses at the ending of the battery current will be +, +, —, +, —, +. When a circular plate of copper or any other conducting substance is interposed between two spirals placed one above the other, and a current from the battery is transmitted through, for example, the lower one, the induced current at the ending of the current of the battery, in the upper spiral, will affect the galvanometer as if no plate were interposed, while the physiological effect, or the power of giving shocks, will be entirely neutralized. This remarkable effect is due to an induced current in the interposed conductor, which is rendered evident by cutting out a slip of the metal extending from the centre to the circumference of the plate; or in other words, by removing one of the radii of which the circular plate may be conceived to be made up, and thus interrupting the circuit, in which an

induced current otherwise could be produced; the shocks with the plate thus cut will be nearly as intense as when the plate is entirely removed. The same effect takes place when instead of the plates a third flat spiral is introduced between the first and second spirals; so long as the ends of this spiral are separated, its presence produces apparently no effect; but if the ends be closed so as to form a perfect circuit which can be traversed by the induced current, the power of giving shocks is neutralized. But the question naturally arises as to how the current in the plate affects the current in the upper spiral so as to destroy its power of giving shocks. The explanation of this is to be found in the fact, that while the current in the battery tends to induce a current both in the plate and in the spiral above it, each of these currents tends to induce an opposite current in the conductor of the other; we may therefore consider the upper spiral as being under the + influence of the current from the battery, and the — influence of the current of the plate; but as the current in the plate produces an equal inductive action in opposite directions at its beginning and ending, the only effect of it will be to prolong the action of the induced current in the upper spiral, or in other words, to diminish its intensity, and hence to neutralize its power to give shocks without perceptibly diminishing its effects on the galvanometer. These facts are of importance in the construction of the inductive apparatus previously described; for if two points of two adjacent spires of the long wire happen to be in metallic contact, so as to form a closed circuit, the effect is the same as that of the interposition of a plate or spiral between the battery current and the induced current; the intensity of the latter will be neutralized, and hence the necessity of the perfect insulation of the several spires of the long wire. For the same reason, if the iron core be enclosed in a hollow cylinder of copper or any other conducting metal so as to separate it from the outer coil of long wire, the great inductive power of the instrument will be neutralized; and it is also on this account that a bundle of varnished iron wires is employed for the core instead of a solid rod of iron. If however the copper cylinder we have just mentioned be interrupted by sawing out a thin slip parallel to its axis, and the solid iron core sawed down from its circumference to its centre, forming a saw-gash in the direction of the radius and in the plane of the axis, the interfering induced currents will be prevented. We have stated that an induced current of considerable intensity is generated in the conductor of the battery itself at the moment of the rupture of the circuit. This also produces, on the principle of the interposed plate, an adverse action which tends to diminish the energy of the induction apparatus; a defect in the instrument which M. Fesso has remedied by causing the rupture to take place in a cup of mercury the surface of which is covered with

oil; the current of the battery is interrupted by drawing the end of the conductor out of the mercury while it still remains in the oil, which being a bad conductor stops in part the induced current. A similar effect is produced by suffering the extra current to expend itself on a large sheet of metal called a condenser. The facts we have here stated have been confirmed and extended by Masson, Verdet, and Acre of France, Dove, Wartmann, Riess, and Lentz of Germany, Marianini of Italy, and De la Rive of Geneva.—*Induced Currents from Discharges of ordinary Electricity.* When a discharge from a Leyden jar is transmitted through two spiral conductors separated by a pane of glass or a stratum of air, induced currents analogous to those we have described are generated of great intensity, and under favorable circumstances the effect may be exhibited at a great distance. Prof. Henry succeeded in magnetizing needles with induced currents at the distance of several hundred yards, by stretching two long wires parallel to each other, and transmitting a discharge from a Leyden jar through one of them. He also obtained inductive effects of the same kind from the discharges of the thunder cloud at a distance of several miles. The direction of induced currents from discharges of the Leyden jar is apparently very capricious; they do not deflect the needle of the galvanometer, and the direction indicated by the magnetization of needles, enclosed in a small helix which forms a part of the circuit, is subject to very complex variations. For example, when the two conductors are near each other, the direction indicated by the magnetization of the needle is opposite to that of the current from the jar. If the two parallel wires or flat spirals be separated to a greater distance, the magnetization of the needle will indicate either a feeble current or one in an opposite direction; and if the distance be still further increased, the opposite polarity of a greater intensity will be exhibited. A change also in the direction of the magnetization of the needle will be produced by an interruption in the circuit of the induced current, or by the proximity of another closed circuit. These results have led European physicists to attempt to ascertain the direction of the current by chemical decomposition and other effects, but the results do not settle the question or throw much additional light on the character of the phenomena. Prof. Henry, however, after a very extended series of experiments, was enabled to refer them all to the peculiarity of the electrical discharge from the Leyden jar. This does not consist of a single discharge from the inside to the outside of the jar, as has been generally supposed, but in a series of discharges forward and backward alternately, until an equilibrium, as it were, is established by a series of oscillations, decreasing in intensity on account of the resistance of the wire, until the normal electrical equilibrium is attained.—*Induction in Masses of Metal in motion.* Arago in 1824 discovered

that when a copper plate is made to revolve rapidly immediately under a magnetic bar freely suspended by an untwisted thread, the motion will be communicated to the latter even through a plate of glass; and also that when a magnetic needle is made to vibrate immediately over a plate of copper, it will come to rest much sooner than when the metal is removed. These facts remained entirely isolated until Faraday showed that they were the results of currents induced in the plate by the action of the magnet. We have seen that when a wire is made to approach at right angles to a magnetized bar, a current is produced in the former opposite to that of the hypothetical current in the near side of the magnet. A similar result must be produced when a plate of metal is moved in the vicinity of a magnetic pole. To illustrate this, let the N. pole of a strong magnetic bar be placed perpendicularly on the middle of an oblong plate of copper, extended in a N. and S. direction; while the bar retains this position, let the plate be drawn in the direction of its length, say southward, under the magnetic pole. A magnetic bar thus placed with its N. pole downward has hypothetical currents revolving around it from W. to E. on the N. side, and from E. to W. on the S. side. If the plate therefore be moved southward, the N. part, which is approaching the pole, will have induced in it a current in an opposite direction to that of the current in the magnet, which will in this case be a current directed toward the west, while the S. part of the plate receding from the magnet will have currents produced in it in the same direction as those in the magnet; but the currents on the S. side of the magnet are moving toward the west, and hence we shall have on both sides of the magnetic pole of the bar currents directed toward the west during the time the plate is drawn from the north toward the south. If we reverse the motion of the plate, the direction of the system of currents will also be reversed. If the poles of a horse-shoe magnet be furnished with two pieces of iron so as to form acting poles at a small distance from each other, and nearly in the same line, and between these a circular disk of copper be made to revolve on an axis parallel to the line joining the poles, so that the latter shall be near the outer circumference, a system of currents from the centre to the circumference of the plate will be produced; the radii of the plate which are approaching and those which are receding from the line joining the magnetic poles will both conspire to produce this effect. If one end of a galvanometer be brought in contact with the axis of the circular plate, and the other made to touch the circumference while it is thus revolving, a constant current will be indicated by the instrument. If the direction of the revolution of the disk be changed, an opposite current will be produced; or if the velocity of the rotation be increased, a corresponding increase will be observed in the intensity of the current. If the magnet employed in this ex-

periment be one of soft iron and suddenly excited by a galvanic current, the copper disk previously put in rapid motion will instantly be stopped. The current in the radii of the plate which are approaching the magnetic pole, being in an opposite direction to those in the magnet, will be repelled; while those in the radii on the other side of the pole, being in the same direction with the current in the magnet, will be attracted; and hence the resultant action of all the induced currents will be to stop the plate. A similar result is produced when a cube of copper of about an inch in diameter is suspended between the poles of a powerful electro-magnet, and caused rapidly to revolve, from the untwisting of a thread by which it is suspended; when the magnet is suddenly excited, the revolution of the cube is instantaneously arrested, and brought to rest without the least oscillation, as if the momentum and consequently the inertia of the mass were instantly annihilated. If, in the case of the arrangement of the revolving disk we have mentioned, a rapid motion be communicated to it by a train of wheels in opposition to the resistance between the induced currents and the magnet, a considerable exertion will be required to continue the motion; and since, according to the principle of the conservation of force, the muscular power expended must produce some effect, and no change is found in the condition of the metal after the experiment, the conclusion was drawn that the energy exerted was expended in generating heat, the truth of which was established by Foucault. The disk thus made to revolve in opposition to the force of the magnet increases in temperature, and soon becomes sufficiently hot to set fire to an ordinary match.—*The Magnetism induced from the Earth and the Sun.* The earth being a great magnet, currents of electricity must be induced in all conducting material in which motion takes place at its surface. These currents are, however, of feeble intensity, but their existence may be shown by connecting the ends of a copper wire several hundred yards in length, covered with silk and wound around a wooden cylinder of about 2 ft. in length, with a galvanometer, and by suddenly turning the axis of the former from a horizontal position into the direction of the dipping needle. During the downward motion of the N. end of the cylinder, the galvanometer will indicate an induced current in an opposite direction to that of the hypothetical current of the earth, and, when the motion is reversed, an induced current in the same direction as that of the current in the earth. From this result it must be inferred that electrical currents are constantly produced by the magnetism of the earth, since no change in the direction and position of a conducting body can take place without developing the inductive action. Moreover, since the sun has been proved to be a great magnet, exerting a powerful action on the earth, the daily rotation of the latter must subject it to an inductive action, similar to that we have de-

scribed in the revolving plate of copper. There can be no doubt, in the present state of science, that such currents actually do take place, but their direction and intensity have not yet been ascertained. But from the association of the magnetic storms we have previously described with the occurrence of the aurora borealis, and also with that of the maximum number of spots on the sun, we are led to the conclusion that the three classes of phenomena are intimately connected, and that they furnish a subject of cosmical research of perhaps as great interest as any which have ever occupied the attention of the scientific world.

MAGNIFYING GLASS. See MICROSCOPE.

MAGNIN, Charles, a French author, born in Paris, Nov. 4, 1793, died there, Oct. 7, 1862. He received a brilliant education, and became in 1813 assistant in the imperial library, and in 1832 one of the directors of that institution. His theatrical criticisms in the *Globe* (1826-'30), his lectures at the Sorbonne (1834-'5) on the origin of the modern stage, and his various writings won for him the praise of Sainte-Beuve, and a seat in the academy of inscriptions and belles-lettres. He also wrote poetry and plays. His principal works are: *Origines du théâtre moderne* (1838); *Causeries et méditations* (2 vols., 1843); *Théâtre de Hroscitha* (1845, with text and translation); and *Histoire des marionnettes* (1852).

MAGNOLIA, a genus of trees and shrubs dedicated by Linnaeus to Pierre Magnol, professor of botany at Montpellier, France, at the close of the 17th century, and who was the first to apply the term "family" to designate groups of botanical genera. The genus is the type of the *Magnoliaceae*, a family as to the limits of which botanists are not agreed; as accepted by Bentham and Hooker (*Genera Plantarum*), it includes nine genera, four of which, *Magnolia*, *liriodendron*, *illicium*, and *schizandra*, are represented within the United States. In *Magnolia* there are fourteen species, six of which belong to Japan, China, and the Himalayas, and the remainder to North America, including Mexico. While a few are low shrubs, the majority are fine trees, some reaching the height of 50, 60, and even 100 ft.; there are both evergreen and deciduous species, and nearly all are ornamental by reason of their fine foliage and flowers. The leaves are alternate, sometimes so crowded upon the stem as to appear whorled, entire, furnished with stout petioles, which when they fall leave broad scars upon the stems; the leaves proceed from cylindrical, acute buds, the integuments or protecting bud scales of which consist of the large deciduous stipules, which are adherent to the base of the petioles; the stipule of each leaf envelops the succeeding leaf next above it, which is folded lengthwise and rests against the next stipular sheath, and so on; the stipules fall away as the leaves unfold. The flowers, usually large, are solitary and terminal, and are white, greenish yellow, or purple; they

have three petal-like sepals, which fall early, and six to twelve petals in two to four series; the numerous stamens are in many series upon the base of the receptacle, which is prolonged into the centre of the flower; the anthers are linear, longer than the filaments, and open inward; the pistils are numerous, consisting of a one-celled, two-ovuled ovary, pointed with a short style; they are densely crowded upon the upper part of the receptacle; in maturing, the ovaries become red, fleshy, and coalesce to form a compound cone-like fruit; when ripe each carpel (ovary) opens and liberates the two seeds, which have a fleshy bright red coat, and are for a while suspended by extensile cobwebby threads, which the microscope shows to be uncoiled spiral vessels. Bitter and somewhat aromatic properties pervade the genus, and the flowers of some species are highly fragrant.—Our most widely distributed species is the small or laurel magnolia, or sweet bay (*M. glauca*), growing in swamps from Cape Ann, Mass., to Florida, usually not far inland; in its northern localities it is only a shrub or low tree with numerous stems from the same root, and is deciduous; but in some of the southern states it grows 50 ft. or more high and becomes an evergreen. The bark of the young shoots is green, and the oblong leaves are dark green above and pale or glaucous beneath; the globular white flowers are about 2 in. across and delightfully fragrant. The fruit is 2 in. long. The bark of the root, the cones, and the seeds, made into a tincture with spirits, are popularly used in some parts of the country as a remedy in rheumatism, and have also been successful in diseases of a typhoid character in the hands of physicians. In the southern states, where the tree grows sufficiently large, the wood has been used for finishing the interiors of houses, for furniture, and similar work; it is of a mahogany color and takes a good polish. The terminal shoots, bearing a flower and a cluster of leaves, are sold in large numbers in the streets of New York and other cities. Like many other plants which grow naturally in swamps, the small magnolia flourishes when transferred to the drier soil of the garden, and may be trained to form a perfectly symmetrical little tree. It is surprising that a native plant of such great merit should be so seldom seen in cultivation; there is a popular impression that it is difficult to manage, which is no doubt due to the fact that large numbers of plants, pulled up rudely from the swamp, are each year sold in cities by itinerant vendors; such plants when set out are sure to die. All of the magnolias are difficult to transplant from their native localities, but trees raised from the seed in nurseries, and several times transplanted, are quite sure to succeed. The manner of propagating the species in general will be found below. This species blooms when only 4 or 5 ft. high; it has produced several garden forms, which differ from the original in the size and shape of their

leaves; one of these, Thompson's magnolia (*M. Thompsoniana*), is said to be a hybrid between *M. glauca* and some other, but it is apparently only a large-leaved variety; it is valuable on account of its fine foliage and long continued bloom. The next northernmost species, known



Laurel Magnolia (*M. glauca*).

as the cucumber tree (*M. acuminata*), is found from western New York westward to Illinois and southward to Georgia, and with one exception is the largest of all our magnolias, reaching from 60 to 90 ft.; it grows rapidly, assumes a fine shape, and its abundant foliage renders it valuable as an ornamental or shade tree; the leaves are thin, 5 to 10 in. long, oblong, pointed, and slightly downy beneath. In this species the flowers add nothing to the beauty of the tree; they are bell-shaped, about 3 in. broad, and consist of twisted or straggling glaucous green petals which are tinged with yellow; the fruit, which is about 3 in. long, resembles when young a small cucumber; the wood is like that of the tulip tree, but is less valuable, and with builders ranks in usefulness with that of the linden; it is somewhat used for the inside work of houses; in the western states it is valued above all other woods for making pumps and for pipes for conveying water. The great-leaved magnolia (*M. macrophylla*) is a still more southern species, S. E. Kentucky being its northernmost locality, whence it extends to Georgia and Florida, but is rare everywhere; it grows to the height of 30 or 40 ft., its trunk and branches clothed with a white bark. This species is the most remarkable in the genus for the size of its leaves and flowers; the ovate-oblong leaves are narrow and heart-shaped at the base and from 2 to 3½ ft. long; the petals are 6 in. long, and the open, bell-shaped flower 8 or 10 in. across, pure white, with a purple spot at the base of each petal, and somewhat fragrant; fruit ovate. It is quite hardy in New York and in some parts of New England, and is worthy of being

planted wherever it will endure the climate. The umbrella tree (*M. umbrellata*), also a large-leaved species, has York and Lancaster counties, Pa., for its northern limit, and is found in most of the southern states; it rarely exceeds 30 ft. in height; the leaves are pointed at both ends and from 1 to 3 ft. long; as they are crowded in a circle at the ends of the irregular branches, the tree presents the appearance expressed in its common as well as its specific name; the flowers are 6 to 8 in. broad, pure white, and have a sweet, heavy odor, which is disagreeable to most persons; its large, rose-colored cones are 4 to 5 in. long and showy. Being a rather straggling tree, it can hardly be considered as very ornamental, although it is an interesting species; it is hardy near Boston; it was formerly called *M. tripetala*. The ear-leaved umbrella tree (*M. Fraseri*, and formerly *M. auriculata*) occurs in Virginia, Kentucky, and southward along the mountains; it grows 40 to 50 ft. high, and though it has some resemblance to the preceding, it is handsomer in all respects; its oblong-obovate or spatulate leaves are auricled or have an ear-lobe-like appendage on each side at the base; they are seldom over a foot long, and are crowded at the ends of the branches in an umbrella-like cluster; the flower is about 6 in. across, white and pleasantly fragrant. The only other deciduous native species is the yellow cucumber tree (*M. cordata*), a native of North Carolina and Georgia; it grows 40 or 50 ft. high, and has oval or roundish leaves, sometimes slightly heart-shaped at base, about 6 in. long; the flowers are 4 to 5 in. wide and of a lemon-yellow color, which contrasts finely with the rich green of the foliage; though a peculiarly southern species, this has proved hardy in New England.—Our only perfectly evergreen species is the great-flowered magnolia (*M. grandiflora*), also called the great laurel magnolia, which grows from North Carolina to Florida and westward to Louisiana. Probably no other American tree has had so much written in its praise as this, and it is deserving of all the encomiums that have been bestowed upon it; for whether we regard it as a forest tree or as a garden ornament, it is unsurpassed for nobleness and beauty. It reaches its greatest perfection in light fertile soils, and those who have only seen the few poor starved specimens that linger along on its northern limits can have no idea of the beauty of well developed specimens. It grows to the height of 60 to 100 ft., and when not crowded by other trees assumes a form as regularly pyramidal as if it had been shaped by art; its oblong or obovate leaves are very thick and leathery, of the darkest shining green above and rusty-colored beneath, from 6, to 12 in. long; the flowers, 6 to 9 in. across, are of the purest white and deliciously fragrant; they are produced during April and May, and after they are gone the red cones show with fine effect against the dark-green foliage. The flowers turn brown

in fading, and the slightest injury to the petals shows itself as a brown spot; if the petals of this or any others of the white-flowered magnolias be written upon with a sharp point, the



Great-flowered Magnolia (*M. grandiflora*).

writing will soon become legible in distinct, dark-brown characters. In some situations in England this tree endures without protection, but generally it needs the shelter of a wood or buildings; in this country Philadelphia seems to be its northern limit, and there its flowering is of rare occurrence; in more northern localities it must be regarded as a greenhouse plant; in those states where it will not only live but thrive, it is deservedly popular, whether planted as single specimens or to line an avenue. A number of well marked varieties have been raised from seeds, differing from the type in form of the leaves, size of the flowers, and other particulars; one of these raised in Georgia is an almost continuous bloomer.—Several of the exotic species are common in cultivation, while others, at the north at least, are only greenhouse plants; some botanists have placed these in separate genera, but they are proper magnolias. The best known of these is the yulan (*M. conspicua*), a Chinese name signifying lily tree, which is often met with as a shrub flowering when only 3 or 4 ft. high, but which grows to a handsome tree of 30 to 50 ft.; the flowers, which appear in early



Magnolia conspicua.

spring (April), before the leaves, are large, white, and fragrant; the leaves are obovate, pointed, and downy when young; the fruit, by the suppression of some of the carpels, is often contorted into most grotesque shapes. This tree is quite hardy in a much colder climate than that of New York, and for its large, early, fragrant flowers is a favorite with many, while others object to it on account of its naked appearance when in flower; there is a celebrated specimen near Newburgh, over 30 ft. high, symmetrical in form, and when in bloom its flowers are estimated by thousands. It is a great favorite with the Chinese, who dwarf it, as they do other trees, by cramping the roots in small pots. A row of seedlings of this magnolia presents a great variety in foliage, and some of these are retained in cultivation under distinct names. The purple magnolia (*M. purpurea*) is a native of Japan; in cultivation it seldom reaches above 10 ft.; it has the same habit of early flowering with the preceding species; the large flowers are pinkish purple outside and white within; the leaves are of a bright dark green; it is somewhat less hardy than the preceding, and in cold localities is treated as a greenhouse plant. Soulange's magnolia (*M. Soulangeana* of the nurseries) is a hybrid between the two just noticed; the tree has the habit and hardness of *M. conspicua*, while the purple tinge in the petals shows its relationship to *M. purpurea*. Lenne's magnolia, of comparatively recent introduction, is supposed to be a variety of *M. purpurea*, from which it differs in its finer foliage and larger and more deeply colored flowers. Several other species or varieties of this group are in cultivation, but their value remains to be ascertained. There are a few other exotic species, but they are rare in our gardens. Campbell's magnolia (*M. Campbellii*), of the Sikkim Himalayas, is described as a large tree with fine foliage, and crimson and white flowers rivalling those of *M. grandiflora* in size and exceeding them in beauty. *M. Kobus* and *M. obovata* are Japanese species grown in greenhouses. *M. fuscata* is a small evergreen shrub with much the appearance of a camellia; its brown stems are hairy, and its flowers, which are brownish red or purple, are exceedingly fragrant; the French call it the black-wooded magnolia on account of the dark color of its wood. This species grows in the open air in Georgia and other southern states, where it is highly prized for its fragrance, and is generally known as the banana shrub; it there forms a dense bush 8 or 10 ft. high.—The magnolias are readily raised from seeds, which germinate better if sown as soon as ripe; if they are to be kept till spring, they must be preserved in slightly damp sand, for if allowed to become perfectly dry they will not germinate. The difficulty of removing wild trees has already been alluded to; they form but few fibrous roots, and hence are usually looked upon by nurserymen as plants very difficult to handle; but if nursery-

grown plants are frequently transplanted during their growth, fibrous roots are formed, and they can be removed with safety; in some nurseries the trees are grown in pots, and these, though necessarily small, are quite safe for the planter to purchase, as they may be turned into the open ground without disturbing their roots. Magnolias are also multiplied by layers, but the tall-growing ones thus treated never produce handsome-shaped trees, and those from seed are preferable. The rarer kinds, especially the Chinese, are grafted upon some species which grows readily from seed, the cucumber tree (*M. acuminata*) being usually selected as the stock upon which to graft. Inarching is also sometimes resorted to to multiply these plants. (See GRAFTING.)

MAGNUS, Eduard, a German painter, born in Berlin, Jan. 7, 1799, died there, Aug. 9, 1872. He studied in Berlin and in Rome, and became known as a member and professor of the Berlin academy and as a portrait painter. He published *Ueber Einrichtung und Beleuchtung von Räumen zur Aufstellung von Gemälden und Sculpturen* (Berlin, 1864), and *Die Polychromie vom künstlerischen Standpunkte* (Bonn, 1872).

MAGNUS, Heinrich Gustav, a German chemist, born in Berlin, May 2, 1802, died there, April 4, 1870. He graduated at the university of Berlin in 1827, where he became in 1834 extraordinary, and in 1845 ordinary professor of physics and technology. In 1828 he discovered the compound formed of the elements of chloride of platinum and of ammonia, the first of a series of combinations of the same substances, and known as the green salt of Magnus. He afterward published "Researches on Capillarity" and observations upon evaporation in capillary tubes. Almost simultaneously Magnus and Regnault made public the results of their experiments upon the coefficient of the dilatation of gases, the former on Nov. 25, 1841, and the latter on Dec. 13, 1841. In 1860-'61 Magnus published his experiments on the transmission of heat through gases in the double aspect of conductivity and radiation, which led to a protracted controversy with Tyndall. His last publication was a memoir on the emission, absorption, and reflection of heat by bodies at low temperatures. His lectures continued till near the close of his life, and for their illustration he formed the physical cabinet of the university.

MAGNUSSEN, or Magnussen, Finn, an Icelandic scholar, born in Skalholt, Aug. 27, 1781, died in Copenhagen, Dec. 24, 1847. He studied at the university of Copenhagen, returned to Iceland in 1803, and practised as an advocate. In 1812 he went again to Copenhagen, where in 1815 he was appointed professor, and in 1819 began to lecture in the university and the academy of fine arts on the old Norse literature and mythology. In 1842 he was made keeper of the archives. He was the author of many archaeological works, of which the most important are: *Bidrag til nordisk Archaeologie* (Co-

penhagen, 1820), in which he maintained the plastic symbolical ideality of the Norse myths, which makes them as appropriate as those of the Greeks for artistic representation; *Priscæ Veterum Borealiæ Mythologiæ Lexicon et Gentile Calendarium* (1828); a translation and explanation of the elder Edda, *Eldre Edda, overaet og forklaret* (4 vols., 1821-'3); and *Eldalæren og dens Oprindelse* (4 vols., 1824-'6), an exposition of the whole doctrine of the Edda from the standpoint of comparative mythology. In connection with Rafn he produced *Grønlands historiske Mindesmærker* (3 vols., 1838-'42), and *Antiquités russes* (2 vols., 1850-'52). He also wrote a work on runes, *Runamo og Runerne* (1841).

MAGOFFIN, an E. county of Kentucky, watered by Licking river; area, about 600 sq. m.; pop. in 1870, 4,684, of whom 179 were colored. The surface is hilly and the soil moderately fertile. The chief productions in 1870 were 5,971 bushels of wheat, 174,591 of Indian corn, 17,488 of oats, 10,660 of potatoes, 13,774 lbs. of wool, and 45,537 of butter. There were 1,063 horses, 1,532 milch cows, 2,908 other cattle, 6,130 sheep, and 5,848 swine. Capital, Salyersville.

MAGOON, Elisha L., an American clergyman, born at Lebanon, N. H., Oct. 20, 1810. He was the son of an architect who was impoverished by sickness, and obtained a good education by his earnings as a bricklayer. He was ordained in 1840, and immediately settled at Richmond, Va., as pastor of the second Baptist church, where he remained six years, and then made the tour of Europe. On his return he became pastor of a church in Cincinnati. Here he remained till 1849, when he became pastor of the Oliver street Baptist church, New York. In 1857 he was called to the pastorate in Albany, and about 1860 removed to Philadelphia, where he now resides (1874). He formed a valuable collection of pictures, especially in water colors, which he sold to Vassar college, Poughkeepsie. In 1853 Rochester university conferred upon him the degree of D. D. His published works are: "Orators of the American Revolution" (New York, 1849); "Living Orators in America" (New York, 1849); "Proverbs for the People" (Boston, 1848); "Republican Christianity" (Boston, 1849); and "Westward Empire" (New York, 1856).

MAGOT. See MACAQUE.

MAGPIE, a conirostral bird of the crow family, and the genus *pica* (Briss.). The bill is long and strong, about as high as broad at the base, with compressed sides, hooked tip, and covered with bristly feathers nearly to its middle; wings long and rounded, with the first quill short, falcate, and attenuated, and the fourth and fifth nearly equal and longest; the tail is very long and graduated, the lateral feathers scarcely more than half the middle; tarsi longer than the middle toe, strong and covered with broad scales in front; toes

strong, and the hind one long, with curved sharp claws; a naked patch behind and below the eye; head without crest; nostrils circular. Nearly a dozen species are described, inhabiting the old world and North America; they are seen generally in pairs, but sometimes in flocks, noisy and restless; they will eat vegetables, grains, mollusks, worms, insects, and even carrion, and destroy eggs and young birds. The nest is made upon high trees or in thick bushes, of large size, of coarse materials plastered with clay, and softly lined with wool, hair, and feathers; there is generally a kind of roof over the nest, with a narrow entrance for the birds. The common magpie of Europe (*P. melanoleuca*, Vieill.) is 18 in. long, with an extent of wings of 2 ft., the tail 10 in., and bill 1½ in.; the plumage of the head, neck, back, anterior part of breast, and abdomen black; the rest of the breast and the outer scapulars white; the tail and wings splendid with green and purple, most of the inner web of the outer quills white; iris dark. This elegantly formed and handsome bird is generally distributed in the wooded districts of Europe; in form it approaches nearest to the jackdaw, but the wings are shorter and the tail much longer. It is fond of coming near human habitations; the flight is rather heavy, but moderately rapid; the notes are almost incessant and hard; the tail is elevated while walking. The eggs are from three to six, about 1½ by 1 in., of a pale green with brown and purplish freckles, or pale blue with smaller spots resembling those of the jay; it is fond of building in the same locality, and frequently in the same nest. From its docility it is an agreeable pet, though it has the propensity common to the crow family of stealing whatever objects,



American Magpie (*Pica hudsonica*).

and especially bright ones, may attract its attention. The American magpie (*P. hudsonica*, Bonap.), though closely resembling the European, is a distinct species; it has a much

longer tail, is of larger size, with a thicker bill, grayish blue outer ring to the iris, the feathers of the throat spotted with white, and the hind part of the back grayish. It is found in the arctic regions, and, in the United States, down to California.

MAGUIRE, John Francis, an Irish journalist, born in Cork in 1815, died there, Oct. 31, 1872. He was called to the Irish bar in 1843. He was member of parliament for Dungarvon from 1852 to 1865, and afterward for Cork until his death. He was mayor of Cork at several periods from 1853 to 1864, was proprietor and editor of the "Cork Examiner," a leading journal of the south of Ireland, and took a prominent part in promoting the linen industry. He published "The Industrial Movement in Ireland in 1852" (1853); "Rome and its Ruler" (1857; enlarged ed., 1859), which, still further enlarged, was published in 1870 under the title, "The Pontificate of Pius IX.," and for this he received a gold medal from the pope; "The Irish in America" (1858); "Life of Father Mathew" (1863); and "The Next Generation," a political novel (1871).

MAGYAR, László, a Hungarian traveller, born in Szabadka in 1817, died in south Africa, Nov. 6, 1864. He attended the naval school at Fiume, entered the Brazilian navy in 1844, and took part in the war between Rosas and Uruguay. He went in 1847 to the Portuguese settlements on the W. coast of Africa, and became commander of the fleet of the negro ruler of Calabar. Having familiarized himself with several negro languages, he left São Felipe de Benguela, Jan. 15, 1849, and crossed the table land of Nano to a comparatively low country, Bihé, where he married the daughter of a chief. On Feb. 20, 1850, he left his new home with his wife and nearly 300 armed men, crossed the river Kokema, and explored the interior, reaching in 1851 the Cazembe river. He went westward as far as the Liba river, and thence northward to the city of Matiamvo, testing his observations by travelling over the same region in different directions. The Portuguese government promoted him to a high civil office at São Paulo de Loanda, with the rank of major. The narrative of his travels from 1849 to 1857 was sent to Pesth; the first volume was published in 1859 at the expense of the Hungarian academy, and was translated into German by J. Hunfalvy.

MAGYARS. See HUNGARY, vol. ix., pp. 55 and 62.

MAHAN, Asa, an American clergyman, born in Vernon, N. Y., in 1799. He graduated at Hamilton college in 1824, and at Andover theological seminary in 1827, and was ordained pastor of the Presbyterian church in Pittsford, N. Y., Nov. 10, 1829. He was pastor of the Sixth street Presbyterian (now the first Congregational) church, Cincinnati, from its organization in 1831 till 1835, when he became president of Oberlin college, and professor of intellectual and moral philosophy and assistant

professor of theology. In 1850 he was chosen president of the Cleveland university, in 1856 became pastor of the Congregational church in Jackson, Mich., and in 1858 of the Congregational church in Adrian, Mich., and in 1861 president of Adrian college, which post he resigned in 1871, continuing to reside in Adrian. He has been a distinguished advocate of the religious views known as Perfectionist, and has published a work entitled "Christian Perfection." His other works are: "The Science of Intellectual Philosophy" (New York, 1845); "The Doctrine of the Will" (1846); "The True Believer" (1847); "Modern Mysteries Explained and Refuted," relating to spiritualist manifestations (Boston, 1855); "The Science of Moral Philosophy" (Oberlin, 1856); and "The Science of Logic" (New York, 1857). He has of late been engaged upon a work entitled "A Critical History of Philosophy."

MAHAN. I. Dennis Hart, an American military engineer, born in New York, April 2, 1802, drowned in the Hudson river, near Stony Point, Sept. 16, 1871. He graduated at West Point in 1824, was appointed second lieutenant in the corps of engineers, and was made assistant professor of mathematics in the military academy. In 1825 he became assistant professor of engineering, and in 1826 was sent by the war department to study in Europe, where he remained four years. In 1832 he was appointed professor of military engineering, which post he held till his death. He received the degree of LL. D. from William and Mary and Dartmouth colleges and Brown university. His death was by suicide, during a temporary insanity resulting from his distress on learning that the board of visitors had recommended that he should be put on the retired list. He published "Treatise on Field Fortifications" (1836); "Elementary Course of Civil Engineering" (1837; rewritten, 1868); "Elementary Treatise on Advanced Guard, Outpost, and Detachment Service of Troops" (1847; improved ed., 1862); "Elementary Treatise on Industrial Drawing" (1853); "Descriptive Geometry, as applied to the Drawing of Fortification and Stereotomy" (1864); and "Military Engineering: Part I., Field Fortifications, Military Mining, and Siege Operations" (1865), and "Part II., Permanent Fortifications" (1867). He edited, with additions, an American reprint of Moseley's "Mechanical Principles of Engineering and Architecture" (1856). **II. Milo**, an American clergyman, brother of the preceding, born at Suffolk, Nansemond co., Va., May 24, 1819, died in Baltimore, Sept. 3, 1870. He was educated at St. Paul's college, Flushing, L. I., took orders in the Protestant Episcopal church in 1845, became rector of Grace church, Jersey City, in 1848, and two years later assistant minister in St. Mark's church, Philadelphia. He was elected professor of ecclesiastical history in the general theological seminary of the Episcopal church in 1851, a post which he

held for 13 years. In July, 1864, he became rector of St. Paul's church, Baltimore. Dr. Mahan published "The Exercise of Faith" (1851); "History of the Church, first Three Centuries" (1860; new ed., first seven centuries, 1872); "Reply to Colenso" (1863); "Palmoni, a Free Inquiry" (1863); and "Comedy of Canonization" (1868). His works have been collected, with a memoir by the Rev. J. H. Hopkins, jr. (3 vols., New York, 1872-'5).

MAHANOH CITY, a borough of Schuylkill co., Pennsylvania, 80 m. N. W. of Philadelphia and 56 m. N. E. of Harrisburg; pop. in 1870, 5,533; in 1874, including suburbs, about 10,000. It is in the Mahanoh valley, 1,211 ft. above the sea, near the watershed between the Delaware and Susquehanna, in the midst of a rich anthracite region. It has railroad communication with Philadelphia, Harrisburg, and New York, by means of the Lehigh Valley and Philadelphia and Reading lines. It is supported by the neighboring mines, which disburse nearly \$200,000 in wages monthly. It has a large foundry, a national and a state bank, two insurance companies, two public halls, three large school houses, a public library, two weekly newspapers, and 13 churches. The first houses were erected in 1859.

MAHANODDY, a river of India, rising about lat. 21° N., lon. 81° E. It flows N. E., S. E., and E., through the provinces of Berar and Orissa, and falls into the bay of Bengal through numerous deltoid arms which divide just below Cuttack, where during the rainy season it is 2 m. broad; its principal mouth is in lat. 20° 18', lon. 86° 40'. It is about 480 m. long, and is navigable during the rains 300 m.; but during five or six months of the year a large part of its channel is dry, and it is fordable even at Cuttack. Diamonds of the finest quality are found in it and in its tributaries.

MAHASKA, a S. E. county of Iowa, intersected by the Des Moines and the N. and S. forks of Skunk river; area, 576 sq. m.; pop. in 1870, 22,508. The surface consists in great part of level or undulating prairies, diversified with woodlands, and the soil is productive. Coal and limestone abound. The Des Moines Valley railroad and the Central railroad of Iowa pass through it. The chief productions in 1870 were 354,732 bushels of wheat, 1,861,282 of Indian corn, 197,109 of oats, 127,145 of potatoes, 138,512 lbs. of wool, 582,402 of butter, and 28,132 tons of hay. There were 8,924 horses, 6,970 milch cows, 11,302 other cattle, 31,652 sheep, and 33,501 swine; 7 manufacturing of carriages and wagons, 2 of marble and stone work, 2 of sash, doors, and blinds, 4 woollen mills, 9 flour mills, and 4 saw mills. Capital, Oskaloosa.

MAHMOUD I., sultan of Turkey, a son of Mustapha II., born in Constantinople, Aug. 6, 1696, died Dec. 13, 1754. He was raised to the Ottoman throne in 1730, after the deposition of his uncle Ahmed III. The janizaries, who had revolted against the latter and made

Mahmoud sultan, exacted from him a promise to continue the war begun against Nadir Shah of Persia. His military operations, however, were disastrous, and he finally concluded a peace in 1736. In the mean while the Russians had begun hostilities, and in 1737 they took Otehakov and Kinburn, while their Austrian allies invaded Wallachia. The latter were however defeated by the Turks at Krotzka on the Danube in 1739, upon which the court of Vienna made peace on disadvantageous terms, relinquishing not only what its forces had recently taken, but also Belgrade, captured during a former war. The Russians obtained a more favorable treaty, retaining all their conquests. In 1743 hostilities again broke out between Persia and Turkey, and were closed by a treaty unfavorable to the latter. Notwithstanding the wars in which his army was engaged, Mahmoud was a man of peaceful disposition, and Turkey was comparatively well governed under him. He was succeeded by his brother Osman III.

MAHMOUD II., sultan of Turkey, the younger son of Abdul Hamed, born in Constantinople, July 20, 1785, died there, July 1, 1839. During his youth, passed in the seraglio, he became familiar with Persian and Turkish literature, and is said to have manifested at an early age a character of great firmness not unmingled with cruelty. His elder brother Mustapha IV., who ascended the throne in 1807, had ordered him to be put to death as a possible rival, when Ramir Effendi, paymaster of the army, rescued him. Bairaktar, the pasha of Rustchuk, raised an insurrection, deposed Mustapha, and placed Mahmoud on the throne, July 28, 1808. Bairaktar became grand vizier, and with the sultan boldly attempted to carry out those European military reforms for promoting which Selim III., the predecessor of Mustapha, had been deposed. The janizaries, whose organization was threatened by this, rose in rebellion, and stormed the seraglio. Bairaktar blew himself up with his enemies, and Mahmoud as a desperate measure ordered Mustapha IV. and his infant son to be strangled, and his four pregnant sultanas to be sewn in sacks and thrown into the Bosphorus. After a long struggle amid pillage and conflagrations, the rebels gained a victory, and the sultan was obliged to submit to their demands. As he was however the only living descendant of Osman, they recognized him as their ruler, dreading the anarchy which must ensue should the royal family become extinct. He now, under very unfavorable circumstances, and without resources, continued the war with Russia and the Servians, until, when totally exhausted, his divan concluded a treaty with the Russians at Bucharest, May 28, 1812, by which the Pruth became the boundary of the two empires, the Servians receiving the promise of an amnesty. From this time the daring and despotic character of Mahmoud manifested itself with striking effect, both in reforms at home and in wars

abroad. The Wahabees of Arabia were subdued by Ibrahim Pasha, the son of the viceroy of Egypt, Mehemet Ali. Dreading the increasing power of Ali Pasha of Janina, Mahmoud made war on him and crushed him in 1822. In 1821 his Greek subjects revolted. By the aid of Mehemet Ali he carried on a successful war against them, but with such extreme cruelty that France, Russia, and Great Britain remonstrated. Their mediation being disregarded by Mahmoud, they attacked and destroyed his fleet at Navarino, Oct. 20, 1827. In 1826, after a desperate struggle, in which he displayed great courage and ability, he had overthrown the janizaries, and organized an army on European principles. With full confidence in its power, he did not shrink from a war against Russia, but was defeated, Diebitsch even crossing the Balkan; and in consequence of the mediation of England, France, and Prussia, he signed the treaty of Adrianople, Sept. 14, 1829. In 1832, Mehemet Ali having refused to withdraw his troops from Syria, which he had occupied, Mahmoud made energetic preparations against him, but was defeated by Ibrahim Pasha at Hems and Konieh, and was only saved by Russian intervention from being dethroned. The result was an alliance for mutual defence between Turkey and Russia. In the mean time Mahmoud had done much to improve the domestic condition of his kingdom. Roads were made, postal communication was established, ambassadors were appointed to the European courts, and women were allowed to appear in public; measures which did not fail to make him many enemies among the conservative party. Justice was speedily and severely administered, and an energetic though unscrupulous police, often aided by the sultan himself, disguised, did much to establish order. But his oppression of all the higher officers of his kingdom, and the frequency with which he plundered, displaced, or slew them, sacrificing men of ability to unworthy favorites, deprived him of trustworthy aid, and his reign was a succession of revolts and treasonable attempts. In 1839, being still determined to reduce Mehemet Ali, he drove him into a new rebellion. His army was again defeated by Ibrahim at Nizib, but he died before the news reached him. He was succeeded by his son, Abdul Medjid.

MAHMOUD, sultan of Ghuzni. See GHUZNI.

MAHOGANY (*Swietenia mahagoni*), a tree of the natural order *meliceae*, a native of South America, Honduras, and the West India islands, and among the most valuable of tropical timber trees. The genus is named in honor of Baron Gerard van Swieten. The mahogany is a large, spreading tree, with pinnate shining leaves. The trunk often exceeds 50 ft. in height and 4 or 5 ft. in diameter. The flowers, in axillary panicles 3 or 4 in. long, are small and greenish yellow, and are succeeded by fruit or capsules of an oval form and the size of a turkey's egg. Though the growth is very

rapid, the wood is hard, heavy, and close-grained, of a dark, rich, brownish red color. The so-called Spanish mahogany, which includes all the above, except that from Honduras, is imported in logs about 10 ft. long and 2 ft. square. The Honduras mahogany is usually larger, the logs being from 12 to 18 ft. long, and from 2 to 3 ft. square. It is chiefly obtained upon low moist land, and is generally soft and coarse. The trees which grow on rocky elevated grounds are of smaller size, but the wood is harder and more beautifully veined. The collection of mahogany for commerce is a most laborious business, often involving the construction of a road through a dense forest and in a most difficult country, upon which the wood may be drawn to the nearest water-course; the logs are roughly squared to prevent them from rolling off of the low rude trucks upon which they are drawn. The natives make this wood serve many useful purposes, as canoes



Mahogany.

and handles for tools. Some have supposed the Honduras to be a different species from the Spanish, from its being lighter in color, as well as porous in texture; but it is now ascertained that these differences arise from the different situations in which the trees are found. The largest log ever cut in Honduras was 17 ft. long, 57 in. broad, and 64 in. deep, measuring 5,421 ft. of inch plank, and weighing upward of 15 tons. The mahogany brought from Africa and the East is decidedly inferior to either of the above; but a fine specimen sent from Calcutta to the London exhibition of 1851 proves that the best quality may be raised in the East Indies. The Spanish mahogany is one of the most useful of all woods for household furniture, for which it is adapted especially by its durability, beauty, hardness, and susceptibility of polish, though of late years it has been less fashionable than some other woods. The finer kinds of furniture are of solid mahogany, but

the greater part of that in use is made of cheaper woods covered with a thin veneer of mahogany. Alkalies are often applied to the lighter colored wood in order to deepen the shade, but the best effect is produced by using a colorless varnish, which brings out in fresh beauty the rich veins, and leaves its natural tints unchanged. The grain, or curl as it is called, is sometimes so beautiful, that it increases the value of the log to an enormous price; several logs have been sold for over \$5,000 each; in one instance three logs, each 15 ft. long and 38 in. square, produced from a single tree, brought \$15,000. It is usually a difficult matter for dealers to judge with precision of the worth of the wood in logs by inspection of the exterior. Mahogany is said to have been employed about the year 1595 in repairing some of Sir Walter Raleigh's ships, but it was not used for cabinet work till 1720, when a few planks from the West Indies were given to Dr. Gibbons of London. A man named Wollaston, employed to make some articles from this wood, discovered its rare qualities, and it was soon in high repute.—See Hooker's "Botanical Miscellany," vol. i. (London, 1830).

MAHOMET. See MOHAMMED.

MAHON. See PORT MAHON.

MAHON, Lord. See STANHOPE, EARL.

MAHONING, a N. E. county of Ohio, bordering on Pennsylvania, drained by the Mahoning and Little Beaver rivers; area, 422 sq. m.; pop. in 1870, 31,001. It has an undulating surface and a highly productive soil. Coal and iron ore are found. It is traversed by the Atlantic and Great Western and the Pittsburgh, Fort Wayne, and Chicago railroads. The chief productions in 1870 were 175,907 bushels of wheat, 361,439 of Indian corn, 449,385 of oats, 124,758 of potatoes, 31,000 of flax seed, 2,684,531 lbs. of flax, 91,757 of maple sugar, 295,467 of wool, 963,557 of butter, and 45,371 tons of hay. There were 7,312 horses, 18,582 cattle, 68,055 sheep, and 8,667 swine; 3 manufacturing establishments, 3 of woollen goods, 2 of bolts and nuts, 1 of nails and spikes, 7 iron furnaces, 4 founderies, 2 rolling mills, 12 tanning and currying establishments, 5 flour mills, and 27 saw mills. Capital, Canfield.

MAHONY, Francis, an Irish journalist, born in Cork about 1805, died in Paris, May 19, 1860. He studied at a Jesuit college in Paris, and subsequently in Rome, where he remained for seven years, and took orders. He afterward abandoned the clerical profession, and joined the staff of "Fraser's Magazine," his contributions to which were published in book form, under the title of "Reliques of Father Prout," in 1836, and republished, with etchings by Maclise, in 1860. He was also one of the earliest and most popular contributors to "Bentley's Miscellany" in 1837. After travelling through Hungary, Greece, Egypt, and Asia Minor, he originated the Roman correspondence of the London "Daily News,"

in which he powerfully advocated the cause of Italy. His letters were collected under the title "Facts and Figures from Italy, by Don Jeremy Savonarola, Benedictine Monk" (London, 1849). He was also for many years Paris correspondent of the London "Globe." In 1864 he retired to a monastery in Paris, where he passed the rest of his life. The "Final Reliques of Father Prout" was edited by Blanchard Jerrold (London, 1874).

MAHRATTAS (*Maha-rashtra*, great people), a people inhabiting the region in central and western India bounded N. by the Satpoora mountains, E. by the Wyne-Ganga and Manjera rivers, S. by the Kistnah and Malpurda, and W. by the Indian ocean. They eventually spread themselves across the whole peninsula, through the dominions of Holkar, Sindia (Gwalior), and the guicowar, and the country of Nagpore, where they still form an important element in the population. Some writers, however, regard them as foreigners who emigrated from the W. part of Persia about the 7th century, and Pickering assigns them an Arabian or Egyptian origin. They are of Hindoo race, and are hardy, active, and well proportioned, but very ill-favored; their stature is small, their skin is dark, and their features are irregular. They are much given to athletic exercises, and are excellent horsemen, but turbulent and predatory, and unfit for regular military service. They are cruel and perfidious, and have exercised a disastrous influence upon the countries they have conquered. They are devout Brahmans. They first become conspicuous in history about the middle of the 17th century, when they possessed a narrow tract of territory bordering on the Arabian sea and extending nearly from Goa to Guzerat. Sevajee (born in 1627, died in 1680), the son of an officer in the service of the last Mohammedan king of Bejapoor, was the founder of the Mahratta empire. Having collected an army among the mountains, he overthrew the kingdom of Bejapoor, and gradually united under his own rule the multitude of petty states among which the Mahrattas were divided. His son Sambajee extended his conquests, but was finally put to death by Aurungzebe in 1689. Under Saho, grandson of Sevajee, the hereditary prime minister or peishwa became the actual ruler of the Mahrattas, and maintained their supremacy against the repeated assaults of Nizam ul-Mulk, the representative of the Mogul emperor in the Deccan. At the culmination of their power, in the middle of the 18th century, the peishwa, with his capital at Poonah, was the recognized head of the confederacy of great chiefs who ruled the several Mahratta states. Guzerat, where subsequently arose the independent power of the guicowar, and a great part of Malwa, were overrun by the Mahrattas, and about 1760 they made themselves masters of Delhi. Defeated however by Ahmed Khan of Afghanistan in the great battle of Paniput (1761), their downfall began; and though they again occupied Delhi (1772), they

lost valuable possessions to the armies of Tip-poo Sahib, and were driven from the Moham-medan metropolis by the British in 1803. A few years later two other Mahratta chiefs, Holkar and Sindia, who ruled the independent states of Indore and Gwalior, founded some 70 years before, entered into a confederacy with the peishwa and the rajah of Berar against the British. After a protracted war the Mahratta power was finally overthrown (1819), the peishwa became a fugitive, and his authority was abolished.—See Grant Duff's "History of the Mahrattas" (3 vols. 8vo, London, 1826), and Owen's "India on the Eve of the British Conquest" (London, 1872).

MAI, Angelo, an Italian scholar, born near Bergamo, March 7, 1782, died at Albano, Sept. 8, 1854. He entered the novitiate of the society of Jesus, and in 1818 was named an associate of the Ambrosian college, and soon after one of the sixteen attached to the Ambrosian library at Milan. When the society of Jesus was formally revived by Pope Pius VII. in 1814, Mai, who had never taken the solemn vows of the order, was induced to remain a member of the secular clergy. In 1819 he became chief keeper of the Vatican library at Rome, soon after librarian, and in 1825 supernumerary prothonotary apostolic. In 1833 he was appointed secretary of the propaganda, and in 1838 prefect of the congregation of the Index and cardinal. His literary reputation was established by his careful exploration of the Ambrosian library, and by several important discoveries in the then almost unknown department of palimpsests. Among his discoveries in Milan were fragments of the orations of Cicero in defense of Scæurus, Tullius, and Placcus, and against Clodius (Milan, 1814); several orations of Cornelius Fronto, and several letters of the emperor Marcus Aurelius and of Lucius Verus (Milan, 1815; new ed., Rome, 1846); a fragment of eight orations of Q. Aurelius Symmachus (Milan, 1815; new ed., Rome, 1846); the complete oration of Isæus on the inheritance of Cleonymus (Milan, 1815); an oration of Themistius (1816); several books of the "Roman Antiquities" of Dionysius of Halicarnassus (1816); an *Itinerarium Alexandri*, and a work of Julius Valerius, *Res Gestæ Alexandri* (1817); fragments of Eusebius and Philo, and of Eusebius's *Chronicorum Canonum Libri duo* (1818), which he restored, in conjunction with Dr. Zohrab, from an Armenian manuscript; and fragments of the *Iliad* from the oldest known manuscripts (Milan, 1819). He also discovered at Rome the long-sought work of Cicero, *De Republica* (Rome, 1822). As keeper of the Vatican library, Mai resolved to publish collections of the unpublished sacred as well as profane authors from the Vatican manuscripts, similar to those of Muratori, Mabillon, and Montfaucon, leaving to future scholars the task of critically editing, commenting, and translating. On this plan he prepared the magnificent *Scriptorum Veterum Nova Collectio e Vaticanis Codicibus edita* (10

vols. 4to, Rome, 1825-'38), *Auctores Classici e Vaticanis Codicibus editi* (10 vols. 8vo, 1828-'38), and the *Spicilegium Romanum* (10 vols., 1839-'44). His last publication, *Nova Patrum Bibliotheca* (6 vols., 1845-'53), forms an indispensable supplement to almost all collective editions of the church fathers. He had also prepared an edition of the celebrated Biblical *Codex Vaticanus*, but died before the completion of the work, which was published by Ver-cellane (Rome, 1857).

MAIDSTONE, a municipal and parliamentary borough and market town of Kent, England, on the Medway, 27 m. W. by S. of Canterbury, and 32 m. S. S. E. of London; pop. in 1871, 26,196. The principal manufacture is of paper. It consists chiefly of four principal streets, intersecting at the market place, well paved, and lighted with gas. It contains a county jail occupying an area of 13 acres, one of the largest parochial churches in England, supposed to be of the 14th century, several other churches, schools, and charitable institutions. All Saints' college, founded in 1846, is kept in the building of the old college of All Saints, suppressed by Edward VI. The navigation of the Medway has been improved, so that vessels of above 70 tons can reach Maidstone.

MAIL, and **Mail Coaches**. See **Post**.

MAIL, Coat of. See **ARMOR**.

MAILÁTH, János Nepomuk, count, a Hungarian historian, born in Pesth, Oct. 5, 1786, died Jan. 3, 1855. He was employed in the public service of Hungary until a disease of the eyes compelled him to relinquish his post; he resumed it at a subsequent period, but was finally thrown out of office by the revolution of 1848. Poverty induced him to emigrate with his daughter Henrietta to Vienna, and subsequently to Munich; and to escape becoming a burden to their friends, father and daughter drowned themselves in the lake of Starnberg. He wrote *Geschichte der Magyaren* (5 vols., Vienna, 1828-'31); *Der ungarische Reichstag 1830* (Pesth, 1831); *Geschichte der Stadt Wien* (1832); *Geschichte des österreichischen Kaiserhauses* (5 vols., Hamburg, 1834-'50); and other works, including original poems and numerous translations from the Hungarian.

MAIMACHIN. See **KIACHTA**.

MAIMBOURG, Louis, a French historian, born in Nancy about 1620, died in Paris, Aug. 13, 1686. At the age of 16 he entered the society of Jesus, and in 1682 he was expelled for defending the tenets of the Gallican party; but Louis XIV. settled a pension on him. At the time of his death he was writing a history of the English reformation. He published *Traité historique sur les prérogatives de l'Eglise de Rome* (1681; new ed., 1831); *Histoire du Wiclifianisme* (the Hague, 1682); *Histoire du Luthérianisme* (1686); and *Histoire du Calvinisme* (Paris, 1686). A uniform edition of his histories appeared in 1686-'7 (14 vols. 8vo, Paris).

MAIMONIDES, Moses (Heb. *Rabbi Mosheh ben Maimon*), commonly abridged into the initial

name *RaMBaM*; Arab. *Abu Amram Musa ibn Abdallah ibn Maimon al-Kortobi*), a Jewish theologian and philosopher, born in Cordova, Spain, March 30, 1135, died in Cairo, Egypt, Dec. 13, 1204. He was the descendant of a family distinguished in the annals of the Jewish community of his native city, at that period a principal seat of Arabic learning, and received from his father Maimon, a theological and astronomical writer in Arabic, a superior education. He was distinguished by a rare proficiency in mathematics, astronomy, medicine, philosophy, and theology, as well as by a surpassing ability as a writer in Arabic and Hebrew. In consequence of the great persecution of Jews, Christians, and sectarian Mohammedans by the dynasty of the Almohades in Cordova, he retired with his father to Fez, and subsequently proceeded to Egypt (1165), passing through Acre and Jerusalem, where his father died. He established himself in Mitza or Fostat (Old Cairo), where he maintained himself for some time by trade, until his scientific acquirements secured his appointment as physician to the court of Saladin, which office he also held under two succeeding reigns. At the same time he was active as a rabbi in the Jewish congregation of Cairo, and especially as a theological teacher, his fame attracting numerous pupils even from the most distant countries of the West. But he exercised a far more powerful influence upon his brethren by his numerous writings, with few exceptions in Arabic, almost all of which have since been acknowledged as standard works. The most distinguished Hebrew translators of the age vied in spreading his masterpieces all over the Jewish world, and thus enabled him to become almost the second lawgiver of his people, and to inaugurate among them a period of literary and philosophical activity, which is still regarded as the golden age of the Jews in exile. Of his works, of which numerous original MSS. are extant in the libraries of Oxford, Rome, Parma, &c., embracing among others treatises on medicine, mathematics, and astronomy, the most frequently reprinted (in Hebrew translations or original) are: *Perush hammishnah* ("Commentary on the Mishnah"), including an introduction and an ethical treatise known under the title of *Shemonah perakim* ("Eight Chapters"); *Sepher hamitzvot* ("The Book of the Commandments"), a systematic compend of the Biblical commandments, both positive and negative, according to the rabbis amounting to the number of 613; *Milloth hakiggayon* ("The Terms of Logic"); *Mishneh torah* ("The Copy of the Law"), a general code of Jewish observances, written originally in Hebrew, in many respects the most extraordinary strictly rabbinical production, generally known under the appellation of *Yad hazakuh* ("The Strong Hand"), from its 14 divisions, *Yad* signifying hand, and the numerical value of the letters of which the word is composed being 14; and *Moreh nebukhim*

("The Guide of the Perplexed"), a philosophy of Judaism, which from its influence on the development of Jewish science and genius is the most important production of the author. The original Arabic text of the last named work, in Hebrew letters, from an Oxford manuscript, was published with a French translation and notes by S. Munk (*Le guide des égarés, traité de théologie et de philosophie par Moïse ben Maimoun*, 3 vols., Paris, 1856-'66). Some of the views of Maimonides having been violently attacked by various western rabbis, his orthodoxy and the rights of philosophy in the synagogue were vindicated among others by his learned son and successor as physician to the Egyptian court, Abraham ben Moses.

MAIN (Lat. *Mœnus*), a river of Germany, formed by two streams rising in N. E. Bavaria, the White Main in the Fichtelgebirge and the Red Main in the Franconian Jura, which unite about 13 m. N. W. of Baireuth. From the junction the river flows W., but with several long bends S. and N., into the Rhine at Castel, opposite Mentz; length about 250 m. It is navigable for nearly 200 m. to its junction with the Regnitz, and the Ludwig's canal connects it with the Danube. The principal towns on its banks are Schweinfurt, Würzburg, Aschaffenburg, Offenbach, and Frankfort.

MAINE, one of the New England states, the most easterly of the American Union, and the tenth admitted under the constitution, between lat. 42° 57' and 47° 32' N., and lon. 66° 52' and 71° 6' W.; extreme length N. and S. 303 m., extreme width 212 m.; area, 35,000 sq. m. It is bounded N. W. and N. by Quebec, E. by New Brunswick, S. E. and S. by the Atlantic ocean, and W. by New Hampshire. As established by the treaty of 1842, the boundary on the east is the St. Croix river and a line run-



State Seal of Maine.

ning due N. from a monument at its source to St. John river; on the north the line follows the St. John and St. Francis rivers to a monument at the outlet of Lake Pohenagamook; and on the northwest it follows the highlands from this lake in a S. W. direction

to the N. E. corner of New Hampshire. Maine is divided into 16 counties, viz.: Androscoggin, Aroostook, Cumberland, Franklin, Hancock, Kennebec, Knox, Lincoln, Oxford, Penobscot, Piscataquis, Sagadahoc, Somerset, Waldo, Washington, and York. The cities are Augusta, the capital (pop. in 1870, 7,808), Auburn (6,169), Bangor (18,289), Bath (7,371), Belfast (5,278), Biddeford (10,282), Calais (5,944), Ellsworth (5,257), Gardiner (4,497), Hallowell (3,007), Lewiston (13,600), Portland (31,413), Rockland (7,074), and Saco (5,755). Portland is the leading commercial city. The largest towns are Brewer (3,214), Brunswick (4,687), Bucksport (3,433), Camden (4,512), Cape Elizabeth (5,106), Deer Isle (3,414), Eastport (3,736), Ellsworth (5,257), Farmington (3,251), Gorham (3,351), Hampden (3,068), Kittery (3,333), Skowhegan (3,893), Thomaston (3,092), Waldoborough (4,174), Waterville (4,852), and Westbrook (6,583).—The population of Maine and its rank in the Union, according to the federal enumerations, have been as follows:

DATE OF CENSUS.	White persons.	Colored persons.	Total population.	Rank.
1790.....	96,002	538	96,540	11
1800.....	150,901	813	151,719	14
1810.....	227,736	969	228,705	14
1820.....	297,340	929	298,269	12
1830.....	398,263	1,192	399,455	12
1840.....	500,493	1,355	501,798	13
1850.....	581,813	1,356	583,169	16
1860.....	626,947	1,327	628,279	22
1870.....	624,809	1,606	626,415	23

Of the total population in 1870, 313,103 were males and 313,812 were females; 578,034 were native and 48,881 foreign born; and there were 499 Indians and 1 Chinaman enumerated. Of those of native birth, 550,629 were born in Maine, 11,139 in Massachusetts, and 9,753 in New Hampshire. Of the foreigners, 26,788 were born in British America, 15,745 in Ireland, and 3,650 in England. The density of population was 17·91 to a square mile. There were 131,017 families, with an average of 4·78 to each, and 121,953 dwellings, with an average of 5·14 to each. Between 1860 and 1870 there was a decrease of 1,364 or 0·22 per cent. in the total population, this being the only state except New Hampshire in which there was a loss. The number of male citizens 21 years old and upward was 153,160. There were 175,588 persons from 5 to 18 years of age; the total number attending school was 155,140. Of persons 10 years of age and over, 13,486 were unable to read, and 19,052 could not write, of whom 9,646 were males and 9,406 females, making the percentage of illiterates 10 years old and over, to the total population (493,847) of the same age, 3·86, which is less than in any other state except Nevada, where the percentage was 2·38, and New Hampshire, where it was 3·81. In the total number (169,823) of male adults, 6,585, or 3·88 per cent., were illiterates; and of 174,068 adult females,

6,834, or 3·91 per cent. The number of paupers supported during the year ending June 1, 1870, was 4,619, at a cost of \$367,000. Of the total number (3,631) receiving support, June 1, 1870, 3,188 were natives and 443 foreigners. The number of persons convicted of crime during the year was 431. Of the total number (371) in prison June 1, 1870, 261 were of native and 110 of foreign birth. There were 324 blind, 299 deaf and dumb, 792 insane, and 628 idiotic. Of the total population 10 years of age and over (493,847), there were engaged in all occupations 208,225, of whom 179,784 were males and 28,441 females; in agriculture, 82,011, of whom 24,738 were agricultural laborers, and 56,941 farmers and planters; in professional and personal services, 36,092, including 890 clergymen, 11,321 domestic servants, 13,833 laborers not specified, 558 lawyers, 818 physicians and surgeons, and 4,183 teachers not specified; in trade and transportation, 28,115, of whom 11,670 were sailors; in manufactures and mechanical and mining industries, 62,007, including 2,697 blacksmiths, 3,757 boot and shoe makers, 6,474 carpenters and joiners, 3,896 fishermen and oystermen, 1,765 lumbermen and raftsmen, 4,187 saw-mill operatives, 2,256 ship carpenters, 2,432 woolen-mill operatives, 8,774 cotton-mill operatives, and 1,131 mill and factory operatives not specified. The total number of deaths from all causes was 7,728; from consumption, 1,991, there being 3·9 deaths from all causes to 1 from consumption; from pneumonia, 495, or 15·6 deaths from all causes to 1 from pneumonia; from diphtheria and scarlet fever, 502; from intermittent and remittent fever, 39; from cerebro-spinal, enteric, and typhus fevers, 641; from diarrhœa, dysentery, and enteritis, 269. According to the census of 1870, there was a greater number of deaths from consumption in Maine, in proportion to the total mortality, than in any other state, the ratio being 25,598 deaths from consumption in 100,000 deaths from all causes; while in New Hampshire, the state ranking next in this respect, the ratio was 22,209 in 100,000.—The coast of Maine extends in an E. N. E. direction, from Kittery point on the west to Quoddy head on the east, about 218 m. in a straight line; but following its exact outline, and including the islands, the length of shore line is 2,486 m. It is studded with numerous islands, and indented by many bays and inlets, forming excellent harbors. The largest island is Mount Desert, having an area of 60,000 acres, and lying W. of Frenchman's bay. Its formation is very peculiar, and its scenery picturesque and striking. Thirteen peaks, the highest of which has an elevation of about 1,800 ft., rise from its surface from W. to N. Besides this; the principal islands are Isle au Haut, off the entrance of Penobscot bay, in which are Deer, Long, and Fox islands, and the Isles of Shoals, a group of eight belonging partly to New Hampshire. Among the largest bays are Pas-

samaquoddy, Machias, Pleasant, Frenchman's, Penobscot, Muscongus, Casco, and Saco. Maine is abundantly supplied with watercourses. The Wallowastook, flowing into the St. John in the north, and the Aroostook in the east, each with numerous tributaries, drain the N. portion of the state. The St. Croix, which flows S. into Passamaquoddy bay, forms a portion of the E. boundary between Maine and New Brunswick. The Penobscot, flowing into Penobscot bay, is the largest river, draining with its branches and connecting lakes the centre of the state, and navigable for large vessels to Bangor, 55 m. from its mouth. The Kennebec, W. of the Penobscot, affords great and valuable water power, and is navigable for ships to Bath, 12 m., and for smaller boats to Augusta, 50 m. from its mouth. Further W. are the Androscoggin and Saco. On the southwest the Piscataqua separates Maine from New Hampshire. Several of the rivers have falls of considerable note. Scattered over the surface of the state is a great number of lakes, the largest of which is Moosehead, 35 m. long and from 4 to 12 m. wide; among others are Sebago, Umbagog, Chesuncook, Baskahegan, Long, Portage, Eagle, Madawaska, Pamedumcook, Millinocket, Sebec, and Schoodic. —The surface is generally hilly, mostly level toward the coast, but rising in the interior. A broken chain of eminences, apparently an extension of the White mountains of New Hampshire, crosses the state from S. W. to N. E., terminating in Mars hill on the borders of New Brunswick. The highest elevation in the range is Mt. Katahdin, 5,385 ft. above the sea. Saddleback, Bigelow, Abraham, North and South Russell, and Haystack are among the others best known.—Maine is almost exclusively a region of the azoic rocks. The W. portion of the state is granitic. The metamorphic rocks abound in a great variety of interesting minerals, and Paris, Oxford co., is noted for its beautiful colored tourmalines; Parsonsfield, York co., and Phippsburg, on the coast of Lincoln co., for varieties of garnet and various other minerals; Brunswick and Topsham for feldspar, &c.; and Bowdoinham for beryls. Over the surface of the country the drift formation is everywhere spread in the form of boulders and sand and gravel. Even upon the highest summits are found scattered rounded fragments of formations situated in places further N. Along the S. portion of the state deposits of tertiary clays are found in many localities beneath the drift. They are characterized by beds of shells of the common clam and mussel, and consequently belong to the newer pliocene. They extend into the interior as far as Augusta and Hallowell, and are penetrated by wells sunk 50 ft. or more below the surface. Limestone quarries are worked in many places among the metamorphic rocks. Along the shore of Passamaquoddy bay are beds of red sandstone, probably of the age of the Connecticut river sandstone. It is pene-

trated by dikes of trap, and at the contact of the two rocks are developed many interesting minerals. On Campbell's island and on the shores of Cobscook bay veins of galena are found of some promise at the contact of trap dikes and argillaceous limestone. Trap abounds in this portion of the state, and in the interior it forms hills of considerable extent. The sources of the rivers are in a wild mountainous territory spreading over the central portion of the state. The mountains are in scattered groups, with no appearance of regular ranges. Their structure is of the metamorphic rocks; and so far as explored they present little of economical importance. On the Aroostook are numerous beds of limestone and one large body of red hematite. Argillaceous slates and limestones prevail over the N. portion of the state. —Maine is said to be rich in minerals, especially in Aroostook, Piscataquis, and Washington cos. Besides marble, slate, granite, and limestone, which are sources of wealth, iron, lead, tin, copper, zinc, and manganese exist. There is also abundance of material for the profitable manufacture of alum, copperas, and sulphur. Granite is obtained in blocks of immense size, some weighing more than 100 tons each. It is of fine grain, beautiful in color, and very durable. The marble is better adapted for building than for ornamental purposes. The principal belt of roofing slate, which is found in immense quantities, extends from the Kennebec to the Penobscot river, a distance of about 80 m. The principal quarries are in Piscataquis co. Most of the slate is suitable for tables, blackboards, writing slates, and pencils. Few attempts have been made to work metallic ores.—The climate is one of extremes. In the year the temperature ranges between 20° or 30° below to 100° above zero; and the isothermal lines vary with the latitude from 45½° to 37° F. The following meteorological summary for Portland, lat. 43° 40' N. and lon. 70° 14' W., has been reported by the United States signal bureau:

YEAR.	Month.	Mean barometer.	Mean thermometer.	Total rainfall, inches.	Prevailing wind.
1871..	October.....	30.053	50.0°	6.55	Southwest.
	November....	29.926	33.0	6.87	Northwest.
	December....	30.004	28.0	3.00	Southwest.
1872..	January.....	29.910	22.5	0.77	Southwest.
	February.....	29.924	28.0	0.35	Northwest.
	March.....	29.900	28.3	1.44	Northwest.
	April.....	29.949	41.8	1.60	Northwest.
	May.....	29.955	52.3	3.23	South.
	June.....	29.950	62.0	5.95	South.
	July.....	29.919	65.7	2.97	South.
	August.....	30.007	67.1	6.97	Southwest.
	September..	30.020	59.3	8.12	Southwest.
Ann'l mean.		29.963	48.9°	42.32	Southwest.

In the extreme northern part of the state the temperature ranges from 5° to 10° lower. The winters are severe, but the temperature is uniform and not subject to violent changes. The snow lies on the ground for from three

to five months. The northeast winds from the Atlantic in the spring and early summer, charged with cold fogs, constitute an unpleasant feature in the climate of a portion of the state.—The soil varies greatly, being sterile in the mountains and fertile in the valleys; the most productive land lies between the Kennebec and Penobscot and in the valley of the St. John. Great forests cover the central and N. portions of the state, yielding immense quantities of timber, which constitutes one of the leading sources of wealth. The most prevalent trees are the pine, spruce, and hemlock; maple, birch, beech, and ash are common, and the butternut, poplar, elm, sassafras, and a variety of others are found in particular districts. Apple, pear, plum, and cherry trees thrive, but the peach has not been cultivated with success. The dense forests still afford retreats for the moose and caribou. There are also the bear, deer, wolf, catamount, wolverene, beaver, marten, sable, weasel, raccoon, woodchuck, squirrel, &c. Wild geese and ducks, eagles, hawks, partridges, pigeons, owls, quails, crows, and humming birds are among the most common birds. The waters off the coast abound with fish, chiefly cod, herring, menhaden, and mackerel; and salmon, trout, pickerel, &c., are found in great abundance in the lakes and rivers.—According to the census of 1870, there were 59,804 farms, containing 2,917,793 acres of improved land, 2,224,740 of woodland, and 695,525 of other unimproved land. The cash value of farms was \$102,961,951; of farming implements and machinery, \$4,809,113; total amount of wages paid during the year, including the value of board, \$2,903,292; total (estimated) value of all farm productions, including betterments and additions to stock, \$33,470,044; of orchard products, \$874,569; of produce of market gardens, \$366,397; of forest products, \$1,581,741; of home manufactures, \$450,983; of animals slaughtered or sold for slaughter, \$4,939,071; of all live stock, \$23,357,129. The agricultural productions were 278,793 bushels of wheat, 1,089,888 of Indian corn, 34,115 of rye, 2,351,354 of oats, 658,816 of barley, 466,635 of buckwheat, 264,502 of peas and beans, 7,771,363 of potatoes, 9,114 of grass and clover seed, 1,053,415 tons of hay, 5,435 lbs. of flax, 1,774,168 of wool, 296,850 of hops, 11,636,482 of butter, 1,152,590 of cheese, 160,805 of maple sugar, 155,640 of honey, 5,253 of wax, 1,374,091 gallons of milk sold, 28,470 of maple molasses, and 7,047 of wine. There were on farms 71,514 horses, 336 mules and asses, 139,259 milch cows, 60,530 working oxen, 142,272 other cattle, 434,666 sheep, and 45,760 swine.—The leading industries are directly connected with the natural yield of land and water, the most characteristic being the production of lumber and lime, the packing of ice, fish, and vegetables, ship building, and stone quarrying. It is estimated that the forests cover 10,505,711 acres, or very nearly one half the entire area of the

state. This is not exceeded in any of the other great lumber-producing states except Michigan and Pennsylvania; while the ratio of the woodland to the entire area is greater in Maine than in any other state. The abundant water power renders the use of steam necessary in only a small number of mills. The great lumber mart is Bangor, where the amount surveyed during the season reaches about 200,000,000 ft. The most important centres of this industry are Penobscot co., where a capital of about \$2,000,000 is employed; Washington co., about \$1,500,000; Hancock, Kennebec, and Piscataquis cos. According to the census of 1870, the number of saw mills was 1,099, having 76 steam engines of 3,213 horse power, and 1,660 water wheels of 38,898 horse power, and employing 8,506 hands. The capital invested amounted to \$6,614,875; wages, \$2,449,132; materials, \$6,872,723; products, \$11,395,747. Ship building, which declined during the civil war, has within a few years attained a prosperity exceeding that of former times. In 1870 Maine ranked next to New York and Pennsylvania in the value of work completed, and next to New York in 1873. In the former year 116 establishments were reported, employing 1,810 hands, and a capital of \$908,173; the value of materials used was \$1,267,146, and of products, \$2,365,745. During the year ending Jan. 1, 1874, there were built in the state 276 vessels of 89,817 tons, being the largest tonnage ever built in one year. Among the vessels were 10 ships of 14,594 tons, 25 barks, 12 brigs, 206 schooners, 12 sloops, and 9 steamers. The principal yards are at Passamaquoddy, Machias, Frenchman's Bay, Castine, Bangor, Belfast, Waldoborough, Wiscasset, Bath, Portland and Falmouth, and Kennebunk. According to the census of 1870, the products of the Maine fisheries, exclusive of the whale fisheries, were exceeded only by those of Massachusetts, the value being \$979,610. This included 79,373 quintals of cod fish, 2,475 of haddock, 10,955 of hake, 2,653 barrels of herring, 31,901 of mackerel, and 75,334 of miscellaneous fish, besides 40,011 barrels of fish oil. The value of fish cured and packed was \$617,878. In 1873, 861 vessels of 46,196 tons were engaged in the cod and mackerel fisheries. About 2,000 men are employed in this industry. The propagation of salmon and trout by artificial means in the interior waters is carried on with success under the direction of the state commissioners of fisheries. Along the coast, from Yarmouth to Cape Sable, the packing of fish, lobsters, clams, &c., is extensively carried on. The catching of lobsters is perhaps more extensive here than anywhere else in the country. The canning of vegetables in the interior is an important industry. The value of canned products in 1873 was \$1,842,000; the number of cans was 735,700 dozens, embracing 475,000 dozen cans of corn, 7,500 of succotash, 231,600 of lobsters, 20,000 of salmon, and 1,600 of clams. Ice is gathered

chiefly in Kennebec and Knox cos. for exportation to various parts of the world. In 1873, 24 establishments cut 301,000 tons, valued at \$552,000. Most of the granite quarries are on the coast, the principal ones being in Knox and Lincoln counties. Here the granite is dressed and shaped for use in buildings in distant parts of the country. The stone quarried in 1870 was valued at \$536,738, and the slate at \$85,000. According to the census of 1870, Maine had more capital invested in the production of lime than any other state except New York, and produced more in value than any except Pennsylvania; the capital invested amounting to \$1,058,000, and the products to

\$1,741,553. In the manufacture of cotton goods Maine in 1870 ranked sixth among the states. The manufacture of woollen goods is also an important industry. The census of 1870 gives the number of manufacturing establishments at 5,550, using 354 steam engines of 9,465 horse power, and 2,760 water wheels of 70,108 horse power, and employing 49,180 hands, of whom 34,310 were males above 16 years of age, 13,448 females above 15, and 1,422 youth. The amount of capital invested was \$39,796,190; wages paid during the year, \$14,282,205; value of materials, \$49,397,757; of products, \$79,497,521. The leading industries are indicated in the following statement:

INDUSTRIES.	No. of establishments.	Steam engines, horse power.	Water wheels, horse power.	Hands employed.	Capital.	Wages.	Materials.	Products.
Blacksmithing.....	604	22	15	1,282	\$417,595	\$175,418	\$346,191	\$1,012,117
Bleaching and dyeing.....	16	....	....	175	263,500	66,980	2,570,522	2,718,950
Boots and shoes.....	398	38	19	2,766	871,683	894,837	2,261,229	8,749,710
Carriages and wagons.....	291	12	438	1,128	538,080	856,207	385,544	1,051,488
Clothing, men's.....	143	....	....	4,563	551,610	509,013	1,568,891	2,881,863
Cotton goods not specified.....	20	320	7,908	9,879	9,789,685	2,550,597	6,671,280	11,739,751
" batting and wadding.....	1	....	....	8	2,000	600	4,500	5,000
" thread, twine, and yarn.....	2	....	....	57	45,000	14,000	71,000	95,800
Edge tools and axes.....	9	150	541	260	214,750	111,882	113,707	842,050
Fish, cured and packed.....	40	....	5	450	160,920	70,280	353,067	617,578
Flouring and grist mill products.....	265	200	8,191	559	944,350	115,308	3,837,570	4,415,998
Iron, forged and rolled.....	4	780	120	463	550,000	272,958	1,051,890	1,501,196
" anchors and cable chains.....	2	6	40	94	85,000	17,400	31,800	58,500
" nails and spikes, cut and wrought.....	2	....	60	22	80,000	12,400	24,500	40,636
" castings, not specified.....	44	350	224	501	704,718	242,654	345,427	749,275
" stoves, heaters, and hollow ware.....	8	10	5	11	7,666	4,818	15,479	28,690
Leather, tanned.....	123	552	1,813	751	1,606,740	285,882	3,021,127	3,779,227
" curried.....	76	109	126	219	238,209	64,244	894,862	1,082,554
" morocco, tanned and curried.....	1	....	....	20	20,000	10,000	40,850	50,000
" board.....	2	....	120	18	86,000	7,800	12,600	28,000
Lime.....	41	....	....	739	1,058,000	211,527	1,222,309	1,741,553
Lumber, planed.....	18	323	107	129	107,500	41,940	238,575	322,375
" sawed.....	1,069	8,213	88,598	8,566	6,614,875	2,449,132	6,872,728	11,895,747
Molasses and sugar, refined.....	8	240	....	155	775,000	117,000	2,958,118	3,142,132
Oil, floor cloth.....	6	98	....	297	525,000	149,500	859,200	1,814,000
" fish.....	23	111	....	876	149,764	41,560	74,955	172,217
Paper.....	13	10	1,608	852	399,000	146,477	864,133	1,214,607
Ship building, repairing, and ship materials.....	118	180	....	1,802	904,478	627,185	1,263,821	2,858,445
Vegetables, canned.....	3	27	....	303	845,000	82,500	247,000	605,000
Woollen goods.....	56	140	8,867	2,925	4,092,655	1,035,488	3,761,715	6,150,620

The industrial interests of Maine have been greatly extended in recent years. The condition of the most important industries in 1873, according to the state industrial statistician, is approximately given in the following statement, the number of establishments making returns being less than the actual number:

INDUSTRIES.	No. of establishments.	Hands employed.	Capital invested.	Value of products.
Bleaching and dyeing.....	3	180	\$300,000	\$5,500,000
Boots and shoes.....	112	5,394	1,863,964	8,820,986
Brick.....	99	917	817,185	620,574
Canned goods.....	33	4,087	825,000	1,842,000
Carriages, wagons, and sleighs.....	50	261	194,165	324,550
Clothing, men's and boys'.....	42	8,603	267,243	611,250
Cotton goods.....	16	10,699	12,252,000	12,151,750
Cotton batting, warp, and yarn.....	5	145	130,000	275,920
Edge tools.....	20	323	430,000	638,800
Fish, cured and packed.....	7	176	21,360	245,256

INDUSTRIES.	No. of establishments.	Hands employed.	Capital invested.	Value of products.
Flouring and grist mill products.....	85	161	620,600	2,276,122
Ice, prepared for market.....	24	160	60,000	552,000
Iron, cast, forged, and rolled.....	22	472	695,200	1,649,640
Leather, tanned and curried.....	61	663	1,529,380	3,187,800
Lime.....	25	456	1,099,500	1,585,025
Lumber, long and short.....	1,066	7,476	6,579,492	9,920,222
" planed.....	6	80	80,000	210,000
Machinery, cotton and woollen.....	8	250	212,800	315,500
Machinery, steam engines, cars, &c.....	30	1,101	1,097,500	2,501,247
Oil fish.....	12	446	323,500	352,550
" kerosene.....	1	25	200,000	264,500
Paper, print'g and wrapping.....	9	536	1,500,000	3,041,600
Printing and publishing.....	81	274	440,262	801,600
Sash, doors, and blinds.....	21	241	370,000	364,450
Shooks, box and hog-head.....	23	368	149,950	652,018
Woollen goods.....	89	2,727	3,217,000	6,605,292

According to the same authority, the total number of establishments devoted to manufacturing and mechanical industry was 6,072, employing 55,614 hands; the capital invested amounted to \$48,808,448; materials used, \$57,911,468; wages paid, \$16,584,164; value of products, \$96,209,136.—The extensive seacoast and numerous harbors of Maine give the state great facilities for commerce. The harbor at Portland is one of the best on the Atlantic coast. There are 14 United States customs districts, viz.: Aroostook (port of entry, Houlton), Passamaquoddy (port of entry, Eastport), Machias, Frenchman's Bay (port of entry, Ellsworth), Castine, Bangor, Belfast, Waldoborough, Wiscasset, Bath, Portland and Falmouth, Saco, Kennebunk, and York. The imports from foreign countries and domestic exports for the year ending June 30, 1874, were as follows:

CUSTOMS DISTRICTS.	Imports.	Exports.
Aroostook	\$40,157	
Bangor	15,884	\$298,867
Bath	21,744	79,071
Belfast	15,980	8,787
Castine	2,919	7,719
Frenchman's Bay	400	6,508
Machias	18,671	101,803
Passamaquoddy	774,279	1,264,107
Portland and Falmouth	2,738,569	3,581,502
Waldoborough	9,784	
Wiscasset	143	27,288
Total	\$3,628,425	\$5,872,102

The chief articles of import were coal, fish, iron, sugar, molasses, and wool; of export, cotton goods, canned fruit, fish, and vegetables, boots and shoes, bacon and hams, lard, and lumber. The vessels entering from and clear-

ing for foreign countries, together with the vessels registered, enrolled, and licensed in the different districts, were as follows:

CUSTOMS DISTRICTS.	ENTERED.		CLEARED.		REGISTERED, &c.	
	No.	Tons.	No.	Tons.	No.	Tons.
Bangor	27	4,171	74	19,327	240	35,670
Bath	6	2,357	22	7,123	278	125,915
Belfast	10	1,275	20	8,446	387	73,772
Castine	6	1,515	18	2,501	356	26,736
Frenchman's Bay	2	40	6	904	817	20,984
Kennebunk	...	...	2	1,808	37	2,820
Machias	21	2,071	169	25,717	249	84,595
Passamaquoddy	227	136,896	860	160,181	215	28,786
Portland and Falmouth	428	218,351	758	250,738	892	101,832
Saco	...	...	2	830	28	8,766
Waldoborough	22	1,910	52	8,327	588	100,643
Wiscasset	1	110	6	1,885	178	9,808
York	...	...	...	...	16	607
Total	750	363,196	1,489	512,237	3,221	585,842

Besides these, there were entered in the coasting trade and fisheries 2,291 vessels of 1,124,127 tons, and cleared 1,526 of 847,178 tons. Of the total number registered, enrolled, and licensed, 3,157 of 547,665 tons were sailing, and 63 of 18,025 tons were steam vessels. The transit and transshipment trade at Portland is larger than that of any other port in the United States.—Maine had 11 miles of railroad in 1841, 293 in 1851, 472 in 1861, 871 in 1871, and 945 in 1874. A board of three railroad commissioners, appointed by the governor and council, are required to examine into and report upon the condition of the railroads in the state, the cause of accidents, &c. The lines in operation at the beginning of 1875, with their mileage, were as follows:

NAME OF CORPORATION.	TERMINI		Miles in operation in the state in 1874.	Length between terminal when different from preceding.
	From	To		
Androscoggin	Brunswick	Leeds Junction	28	...
Branch	Crowley's Junction	Lewiston	5	...
Atlantic and St. Lawrence	Portland	Island Pond, Vt.	82	149
Branch	Main line	Lewiston	6	...
Bangor and Piscataquis	Bucksport	Brewer	18	...
Belfast and Moosehead Lake	Oldtown	Abbot	54	...
Boston and Maine	Belfast	Burnham	83	...
European and North American	Boston, Mass.	Portland	45	116
Knox and Lincoln	Bangor	St. John, N. B.	114	206
Leeds and Farmington	Bath	Rockland	49	...
Maine Central	Leeds Junction	Farmington	39	...
Newport and Dexter	Cumberland	Bangor	129	...
Portland and Kennebec	Newport	Dexter	14	...
Branch	Portland	Skowhegan	100	...
Portland and Ogdensburg	Brunswick	Bath	10	...
Portland and Oxford Central	Portland	Dalton, N. H.	52	110
Portland and Rochester	Mechanic's Falls	Canton	27	...
Portland, Saco, and Portsmouth	Portland	Rochester, N. H.	49	52
Portsmouth, Great Falls, and Conway	Portland	Portsmouth, N. H.	52	...
St. Croix and Penobscot	Conway Junction	North Conway, N. H.	4	71
Somerset	Calais	Princeton	22	...
	West Waterville	Norridgewock	18	...

Of the lines above mentioned, the Androscoggin, Belfast and Moosehead Lake, Leeds and Farmington, Newport and Dexter, and Portland and Kennebec are leased and operated by the Maine Central company; the Portland,

Saco, and Portsmouth, by the Eastern of Massachusetts; the Atlantic and St. Lawrence by the Grand Trunk of Canada; and the Bangor and Piscataquis by the European and North American railway company. Lines of steam-

ers ply regularly between the larger cities and Boston. Steamers also ply between Portland, New York, St. John, N. B., and Halifax, and during the winter between Portland and Liverpool and Glasgow.—The number of national banks in operation in 1874 was 64, having a paid-in capital of \$9,840,000, and a circulation outstanding of \$7,946,576. The circulation per capita was \$12 67, while the ratio of circulation to wealth was 2·2 per cent., and to bank capital 80·8 per cent. Savings banks are well distributed throughout Maine, and are managed with great care. In 1874 there were 58, with \$31,051,963 deposits and 96,799 depositors, the average amount on deposit by each being \$320. The deposits in these institutions amount to nearly \$6,500,000 more than the circulation and deposits of the national banks of the state. The number of fire, marine, and fire and marine insurance companies doing business in the state, Jan. 1, 1874, was 120, of which 41 were Maine companies.—The government of Maine is founded on the constitution of 1820. Every adult male citizen of the United States, not a pauper or criminal, who has resided in the state three months, is entitled to vote at elections. The legislature is composed of a senate of 31 members and a house of representatives of 151 members, all elected annually by the people. The general election is held on the second Monday in September, and the legislature meets in Augusta on the first Wednesday in January annually. The governor (salary \$2,500) is also elected annually, and is assisted in his executive duties by a council of seven members, elected on joint ballot by the legislature. The secretary of state (salary \$1,500) and the state treasurer (salary \$1,600) are also elected by the same body and in the same way. Other state officers are the attorney general, adjutant general, superintendent of common schools, land agent, insurance commissioner, bank examiner, three railroad commissioners, superintendent of public buildings, librarian, two assayers, inspector general of beef and pork, inspector general of fish, two commissioners of fisheries, industrial statistician, and two Indian agents. The governor appoints, with the advice and consent of the council, besides certain judicial officers, the attorney general, the sheriffs, coroners, registers of probate, and notaries public. The judiciary consists of a supreme court of eight judges, who are appointed by the governor and council for a term of seven years, and receive a salary of \$3,000 a year each; the superior court of Cumberland co., held in Portland, with one judge appointed in the same way and for the same term; probate courts in each county, the judges being elected by the people for terms of four years; municipal and police courts; and trial justices, appointed by the governor and council for seven years, with jurisdiction where the amount does not exceed \$20. The state is divided into three judicial districts, eastern, middle, and western,

in each of which the supreme court holds an annual session as a court of law. Trial terms are also held in each county for civil and criminal business, except that in Cumberland co. the superior court has exclusive criminal jurisdiction. In each county there is a judge and register of probate. There is a state board of immigration, consisting of the governor, secretary of state, and land agent, who are required to appoint a commissioner of immigration. The board may give to each male adult immigrant 100 acres of the public land on which to settle. It is the duty of the industrial statistician, which office was created in 1873, to collect and publish statistical information concerning the manufacturing, mining, commercial, agricultural, and other industrial interests, together with the valuation and appropriations for various purposes of the several towns and cities of the state. Maine is represented in congress by two senators and five representatives, and has therefore seven votes in the electoral college.—The laws for the prevention of intemperance in Maine have always been of a rigid character. The present law vests the sale of intoxicating liquors in special agents appointed by the state, and prohibits all other persons from selling such liquors, including ale, porter, strong beer, lager beer, and other malt liquors, wine, and cider, as well as all distilled spirits. The manufacture of intoxicating liquors for unlawful sale is also forbidden. The provisions of the law, however, do not extend to the manufacture and sale of unadulterated cider or wine made from fruit grown in the state. The lawful sale of liquors is under the direction of a commissioner who is appointed by the governor, and who is required to furnish municipal officers of towns in Maine, and duly authorized agents of other states, with pure unadulterated intoxicating liquors, to be sold for medicinal, mechanical, and manufacturing purposes. If an authorized agent violates the law, he is subject to a fine not exceeding \$30, and imprisonment not exceeding three months; while the penalty for a violation by a common seller is \$100 fine or three months' imprisonment for the first, and \$250 fine and four months' imprisonment for the second and each subsequent offence. Any one having been injured by an intoxicated person may maintain an action for damages against the person who sold the liquor; and the owner or lessee of the building in which the liquor was sold is jointly liable if cognizant that it was used for such purposes. A married woman may hold in her own right real and personal estate acquired by descent, gift, or purchase, and may convey or devise the same by will, without the consent of her husband, except such real estate as has been directly or indirectly conveyed to her by her husband or his relatives, in which case the husband must join in the conveyance. A woman does not lose and a husband does not acquire rights to her property by marriage. The husband is not liable for the debts of the wife

contracted before marriage, nor for those afterward contracted in her own name; but she is liable in both cases, and may be sued. Marriages, births, and deaths must be registered in every town, and reported to the secretary of state. Intention of marriage must be recorded in the office of the town clerk at least five days before the certificate is granted, and the marriage must be solemnized by a minister or justice of the peace. White persons are prohibited from marrying negroes, Indians, or mulattoes. Treason, murder in the first degree, and arson of an occupied dwelling in the night, are punishable with death; so also is killing in a duel, and the seconds are liable to the same punishment as the principals. Rape, arson of a dwelling in the day time, and burglary at night by a person armed with a weapon, or making an assault, are punishable with imprisonment for life. Adultery is punished with imprisonment for not less than one nor more than five years.—The receipts into the state treasury during the year ending Jan. 1, 1875, amounted to \$1,423,473, and the expenditures to \$1,524,497. Of the receipts, \$142,258 was from the tax on savings banks, and \$67,996 on public lands, while nearly all of the remainder, about \$1,170,000, was from direct taxation. Of the expenditures, \$432,200 was on account of interest, and \$238,276 on account of sinking fund and principal of public debt; about \$82,000 for special and exceptional appropriations; \$407,477 to towns for common schools; and about \$320,000 for general state purposes. On Jan. 1, 1875, the entire amount of the public debt was \$7,088,400, of which \$2,223,000 was in registered and \$4,865,400 in coupon bonds. Deducting the sinking fund (\$1,514,022) held for the payment of the debt, the liability of the state amounted to \$5,574,378. While in many other states a large portion of the public revenues is raised by indirect taxation, in Maine nearly the entire amount is derived from direct taxes. The rate on the valuation of 1874 was five mills on the dollar. The total value of real and personal property in 1874, estimated on a true cash basis, was stated at \$254,000,000. The assessed value of real estate, as returned by the census of 1870, was \$134,580,157, and of personal property \$69,673,623; the true valuation of real and personal estate was \$348,155,671. The total amount of taxation not national was \$5,348,645, of which \$1,350,305 was state, \$315,199 county, and \$3,683,141 town, city, &c.—The institutions supported wholly or in part by the state are the insane hospital, reform school, state prison, soldiers' orphans' home, and two normal schools. The insane hospital in Augusta was opened in 1840, since which time 4,404 patients have been received, of whom 4,011 have been discharged, 1,770 recovered, 767 improved, 675 unimproved, and 799 have died. The daily average under treatment in 1874 was 406. Of the 393 in the hospital at the close of the year, 43 were supported by the

state, 291 were receiving state aid of \$1 50 per week, and 59 were supported by their friends at the rate of \$4 or \$7 per week, according to accommodations. The capacity of this institution is inadequate to the needs of the state, and provision has been made for the erection of another. The total expenditures on account of the hospital in 1874 were \$103,917, of which the state paid about \$34,000 for the support of indigent insane, and towns and individuals about \$56,000. Maine has no state institutions for the care of the deaf and dumb or the blind; but \$14,179 was paid from the treasury in 1873 for the education in other institutions of 55 deaf and dumb and 11 blind beneficiaries. The state prison at Thomaston at the beginning of 1874 contained 129 convicts, of whom 55 were under sentence for larceny, 20 for burglary, and 12 for murder. The average annual number of commitments during the ten years ending with 1873 was about 51. With the exception of a period of about eight years, the state has always employed the labor of the convicts in manufacturing operations on its own account, producing carriages, harness, and boots and shoes. In 1873 the labor of the convicts defrayed all the expenses of the institution, and yielded to the state a net profit of \$6,545. During the 20 years ending with 1873 the sales of the product of convict labor amounted to \$614,028. A beginning has been made of introducing this system of industry into the various county jails. The average number of convicts in the 13 jails of the state in 1873 was 76, making with the average number in the state prison (146) a total of 222. The reform school, opened in 1852, is about 4 m. from Portland, where a farm of 160 acres is devoted to the purposes of the institution. Boys between the ages of 8 and 16 years are received, and besides attending school four hours a day are occupied in farming, making bricks, shoes, and chairs, and in general housework. The average number of boys in 1874 was 137, and the appropriation by the state amounted to \$20,000. An industrial school for girls was opened in Hallowell in 1875. The military and naval orphans' asylum at Bath affords a home for the children of the soldiers who died in the civil war. The number of inmates at the close of 1874 was 55; state appropriation, \$10,000. There is also a general orphan asylum in Bangor, which receives state aid. The Maine general hospital in Portland is aided by the state.—The educational interests of the state are under the supervision of a state superintendent, appointed by the governor and council, and there are city superintendents. Every city, town, and plantation is required to raise and expend annually for the support of schools therein not less than \$1 for each inhabitant, under penalty of not receiving any share of the state school fund. The permanent school fund, derived chiefly from the sales of wild lands belonging to the state, amounts to \$369,883. Besides the income of this fund, the

chief sources of revenue for school purposes are a state tax of one mill per dollar of valuation, a town tax of 80 cents per capita, and a tax of one half mill per dollar of the deposits of savings banks. The cost of supporting the public schools in 1874 (current expenses) was \$1,237,778, being about .005 on the state valuation, \$1 97 for each inhabitant, \$5 49 for each person of school age, and \$11 21 according to the average attendance. The school funds are apportioned among the several towns according to the number of persons between 4 and 21 years of age. The chief facts relating to the schools of the state are as follows:

Number of persons between 4 and 21 years of age.	225,219
" registered in summer schools.....	122,453
Average attendance.....	98,744
Number registered in winter schools.....	132,833
Average attendance.....	108,478
Average duration of schools for the year, 20 weeks and 2 days.	4,043
Number of school districts.....	4,199
" houses.....	4,199
Estimated value of all school property.....	\$3,079,311
Male teachers in summer.....	161
" in winter.....	1,928
Female teachers in summer.....	4,366
" in winter.....	2,367
Teachers, graduates of normal schools.....	294
Average wages of male teachers per month.....	\$36 17
" of female teachers per week.....	\$4 05
Amount of school money voted.....	\$673,314
Excess above amount required by law.....	\$157,752
Amount raised per scholar.....	\$2 90
" received from state treasury during 1874.	\$367,009

By a recent act of the legislature a system of free high schools throughout the state has been established, the state defraying one half the cost of instruction upon certain conditions. In 1874 there were 355 terms of free high schools open, with 14,820 pupils enrolled. The amount paid by the state in aid of these was \$39,969. Sixteen teachers' institutes were held in 1874, besides numerous educational conventions and associations. The normal schools are under the direction of seven trustees, five of whom are appointed by the governor, who, with the superintendent of common schools, is an *ex officio* member. The western state normal school at Farmington was established in 1863, and in 1873-'4 had 8 instructors and 63 students during the autumn and 86 during the spring term, besides 81 in the model school. The course occupies two years, and tuition is free to those pledging themselves to teach in the public schools of Maine for as long a period as they have been connected with the normal school. The eastern state normal school at Castine was opened in 1867, and in 1873-'4 had 8 instructors and 94 students in the autumn, 58 in the winter, and 130 in the spring term; 170 of the total were females, and 112 males. Tuition is free, but graduates are expected to become teachers in the public schools of the state. In 1873 the state appropriated \$17,500 for normal schools. The state college of agriculture and the mechanic arts, at Orono, has received the grant of public lands made by congress for the establishment and maintenance of such institutions in the several states. A farm of 370 acres of superior land affords excellent facilities

for the experimental purposes of the institution. Five courses of instruction are offered: in agriculture, civil engineering, mechanical engineering, chemistry, and an elective course. The studies of the several courses are essentially in common during the first two years. Prominence is given to military instruction, and the students are required to devote not exceeding three hours a day for five days in the week to manual labor, for which they receive compensation. This institution was opened in 1868, and in 1874 had 8 instructors and 121 students. It is provided with valuable apparatus and a library of 2,000 volumes. The most prominent educational institutions are Bowdoin college in Brunswick (see BOWDOIN COLLEGE), Colby university (Baptist) at Waterville, and Bates college (Freewill Baptist) at Lewiston. Colby university was organized in 1820, and in 1874 had 7 instructors and 62 students; the library contains about 10,000 volumes; 66 scholarships, each yielding from \$36 to \$60 per annum, have been founded for the benefit of students needing aid; the university is open to students of both sexes. Bates college was organized in 1863; connected with it is a theological department, which was opened in 1870; the libraries of the institution comprise 8,300 volumes; in 1874 there were 8 instructors and 104 students, besides 18 students in the theological department. The theological seminary at Bangor (Congregational), established in 1820, is open to the Protestants of every denomination; the course of instruction comprises three years; in 1874 there were 4 professors, 40 students, 520 alumni, and a library of 14,000 volumes. Instruction in medicine is afforded by the medical department of Bowdoin college, which is known as the medical school of Maine, and by the Portland medical school. The Maine Wesleyan seminary, at Kent's Hill, and the Westbrook seminary (Universalist), with a collegiate course for young ladies, at Deering, afford to students of both sexes classical, scientific, normal, and other courses. In 1874 the former had 14 instructors and 389 pupils, of whom 176 were females, and a library of 25,000 volumes, besides valuable collections. The East Maine conference seminary and commercial college, pleasantly situated at Bucksport, is also open to both sexes, and provides several courses of instruction; in 1874 there were 6 instructors and 201 students, including 92 females.—According to the census of 1870, there were in the state 3,334 libraries, containing 984,510 volumes; of these, 1,872, with 450,963 volumes, were private, and 1,462, with 533,547 volumes, were other than private, including the state library with 20,000 volumes, 58 town and city with 14,649 volumes, 19 law with 9,748, 25 school, college, &c., with 63,425, 1,079 Sabbath school with 277,742, 140 church with 39,910, and 136 circulating with 100,273. The principal libraries are the state library in Augusta, which in 1874 contained 28,000 volumes; Bowdoin college, 35,000; Portland in-

stitute and public library, 15,378; Bangor theological seminary, 14,000; mechanics' association library of Bangor, 13,700; Colby university, 10,000; Bates college, 8,300; and Hallowell social library, 5,000. The number of newspapers and periodicals was 65, having an aggregate circulation of 170,690, and issuing annually 9,867,680 copies. In 1870 there were 7 daily newspapers, with a circulation of 10,700; 1 tri-weekly, circulation 350; 47 weekly, circulation 114,600; 1 semi-monthly periodical, circulation 700; 8 monthly, circulation 42,840; and 1 quarterly, circulation 1,500. In 1874 there were 9 dailies, 56 weeklies, 1 semi-monthly, 4 monthlies, and 1 quarterly.—The total number of religious organizations in 1870 was 1,326, having 1,102 edifices with 376,038 sittings, and property valued at \$5,196,853. The denominations were represented as follows:

DENOMINATIONS.	Organizations.	Edifices.	Sittings.	Property.
Baptist, regular.....	262	213	70,966	\$558,050
" other.....	213	154	46,223	382,917
Christian.....	44	20	4,922	42,200
Congregational.....	231	219	83,985	1,401,786
Episcopal (Protestant).....	25	23	8,975	250,213
Jewish.....	23	23	7,315	36,400
Lutheran.....	1	1	500	800
Methodist.....	327	264	82,530	885,237
New Jerusalem (Swedenborgian).....	3	2	1,200	53,000
Roman Catholic.....	32	32	17,822	461,700
Second Advent.....	23	13	3,175	13,050
Shaker.....	2	2	700	4,000
Spiritualist.....	3	1	200	300
Unitarian.....	18	13	9,155	245,000
Universalist.....	54	65	23,910	434,650
Unknown (Union).....	26	54	15,130	96,400

—Maine was visited in 1602 by Bartholomew Gosnold; in 1603 by Martin Pring; in 1604 by the French under De Monts, who wintered near the present site of Calais on the St. Croix, and in the following spring took possession of the shores of the river Sagadahoc or Kennebec; and in 1605 by Capt. George Waymouth. In 1607 the Plymouth company, having obtained a grant which included this territory, sent out a colony under George Popham and Raleigh Gilbert, but it remained only one year. In 1613 a French colony fitted out by Mme. de Guercheville, a pious Catholic lady to whom had been transferred the patent of De Monts, landed at Mount Desert, with the purpose of establishing a centre for missionary operations. The Virginia magistrates, however, sent an armed force which dispersed the emigrants and destroyed their settlement. In the following year Capt. John Smith arrived at Monhegan island, and went at once to the Kennebec, where he traded profitably with the Indians, explored the coasts, and compiled a short history of the country. In 1620 Sir Ferdinando Gorges obtained a new patent from James I., granting to the Plymouth company all the country between lat. 40° and 48° N., including that upon which the pilgrims landed in the following December. Gorges regarded these persons as intruders, and sub-

sequently endeavored to oust them as well as the Massachusetts colony established under Winthrop at Charlestown and Boston. In 1621 the company transferred to William Alexander, afterward earl of Stirling, the country E. of the St. Croix (then all designated Nova Scotia), thus establishing the E. boundary of Maine as it now stands. Monhegan, the first or one of the first spots in Maine permanently peopled by Europeans, was settled in 1622, and Saco in 1623, or perhaps earlier. About 1629 the Plymouth company began to parcel out their territory in grants to suit applicants. In that year John Mason acquired the territory lying between the Merrimack and Piscataqua rivers, and called it New Hampshire, thereby settling the western boundary of Maine. In the course of two or three years the whole coast had thus been disposed of as far E. as the Penobscot. The country between the Penobscot and St. Croix, and even to the W. of the former river, was claimed by the French, and long remained a subject of dispute. In 1635 the Plymouth company, having resolved to give up its charter to the government, divided the territory among its members, Gorges taking the whole region between the Piscataqua and the Kennebec, of which he subsequently (1639) received a formal charter from Charles I. under the title of the province of Maine. Gorges was now appointed governor general of New England, with almost unlimited powers. (See GORGES.) His son Thomas was sent over as deputy in 1640, and established himself at Agamenticus, now York, where in 1642 arose a city called Gorgeana. On the death of Sir Ferdinando, Maine descended to his heirs. It was now really placed under four different jurisdictions: 1, that of Gorges, extending from the W. line to Kennebunk; 2, that of Rigby, from Kennebunk to the borders of the Kennebec valley, held under grant from Sir Ferdinando; 3, the Sagadahoc, from the Kennebec to the Penobscot; 4, the French (Acadia), from the Penobscot to the St. Croix. Massachusetts, apprehending that these fragmentary and unsettled governments might fall into hands hostile to her interests, and stimulated by the wishes of many of the inhabitants, set up (1651) a claim under her charter to the province of Maine, and sent commissioners to admit the people of Gorges's and Rigby's grants into the jurisdiction of the Bay colony. The governments of Gorges and Rigby remonstrated, and carried the matter before the English parliament; but the Puritan party was now in the ascendancy at home, and the claims of the Puritan colony of Massachusetts were heard with more favor than the protests of zealous royalists and adherents of the established church. In 1652, 150 freemen in five towns took the oath of allegiance to Massachusetts, which continued to exercise its authority in such a way as to prove that, however slight its claim to jurisdiction, the transfer was equally beneficial to both parties. The

towns were governed in local matters nearly as they are now, and the rules of church discipline were less strict than in some other colonies, the people being generally favorable to religious freedom. No acts of persecution stain their history, and they frequently afforded an asylum to fugitives from intolerance in other parts. In 1653 Cromwell annulled the transfer of Acadia to France, which had been effected in 1632, and sent out Sir Thomas Temple as governor. He retained his post till 1667, when Acadia reverted to France in accordance with the treaty of Breda. In the mean time the Stuarts had been recalled to the throne of England, and the heirs of Gorges petitioned for the restoration of their territory in Maine. Royal commissioners were accordingly sent by Charles II. in 1664 to reestablish the authority of the grantees. Massachusetts resisted, and a conflict of jurisdictions ensued, which was terminated in 1677 by Massachusetts purchasing the interests of the claimants for £1,250 sterling. As early as 1607, according to De Peyster's "Dutch in Maine," the Dutch had attempted to gain and colonize this coast. In 1674 they conquered the coasts of Nova Scotia and Acadia adjacent to the Penobscot, first capturing Fort Pentagoet or Pemtegoevett (Castine). In 1676 Cornelis Steenwyck was made governor of the conquered district by the Dutch West India company. The Hollanders, however, were soon after expelled by settlers from Boston. In 1675 the first Indian war in Maine was begun by King Philip, at whose instigation a series of unprovoked attacks were made upon the settlers, and more than 100 white persons were massacred within three months. Thenceforth the savages held the country in terror till 1700. Meanwhile disputes were excited by the claims of the duke of York, who, under a grant from Charles II. of the Dutch territories in North America, professed to hold all that part of Maine lying between the Kennebec and St. Croix rivers. Sir Edmund Andros was commissioned as governor of the duke's territories in New York and Maine; but Massachusetts, having caused a new survey of the E. limit of her patent to be made, under which she pushed her boundary forward to the W. shore of Penobscot bay, continued to hold possession of all the colony except Sagadahoc and Pemaquid. When the duke came to the throne as James II., Andros was made governor of New England, and visited Maine, where he was guilty of great extortion. The Massachusetts charter had already been declared forfeit. The revolution of 1688, however, restored things to their former state, and thenceforth the history of the colony of Maine is merged in that of Massachusetts. From the close of Indian hostilities Maine began to make steady progress in civilization and wealth. The war of the revolution affected her but little, but during that of 1812 she was again exposed to the horrors of frontier struggles. The British obtained possession

of a part of the country, and kept it until the conclusion of peace. The final separation of Maine from Massachusetts took place March 15, 1820, when she was admitted into the Union as an independent state. Ever since the treaty of 1783 a dispute had existed between the government of the United States and Great Britain as to the proper interpretation of that treaty so far as it related to the boundary between Maine and the British possessions. This controversy was finally settled by the treaty of Washington in 1842, by which Maine and the United States agreed to cede to Great Britain a small portion of the territory claimed by her, in return for the concession of Rouse's Point and the free navigation of the river St. John. The enterprise of founding a Swedish colony in Aroostook, begun in 1870, has proved successful. The place selected is called New Sweden, where in 1873 about 600 Swedes aided by the state had settled upon 20,000 acres of land. The colonists have their own municipal organization and schools, in which the chief study is the English language.

MAINE, an ancient province of France, and with Perche one of the great military governments of the kingdom, bounded N. by Normandy, E. by Perche and Orléannais, S. by Touraine and Anjou, and W. by Brittany. It is now almost entirely included in the departments of Mayenne and Sarthe. Its capital was Le Mans. Under the Carlovingian and early Capetian kings the province was governed by counts; it was subsequently in turn united with Normandy and Anjou, became subject to the kings of England, was wrested from John by Philip Augustus, and after various transfers was united with the crown of France in 1481.

MAINE, Sir Henry James Sumner, an English jurist, born in 1822. He graduated at Pembroke college, Cambridge, in 1844, and was regius professor of civil law at Cambridge from 1847 to 1854, when he became reader on jurisprudence in the Middle Temple. From 1862 to 1869 he was a law member of the government in India, where he introduced several legislative reforms. In 1870 he was appointed to the newly instituted Corpus professorship of jurisprudence in Oxford university, and in 1871 a member of the council for India. He has published "Roman Law and Legal Education," in "Cambridge Essays" (1856); "Ancient Law: its Connection with the Early History of Society" (8vo, 1861; 5th ed., 1874; reprinted, with an introduction by Prof. T. W. Dwight, New York, 1864); and "Village Communities in the East and West" (1871; 2d ed., 1874), being six Oxford lectures, giving the results of his observations in India, where he had studied the working in village communities of social organisms supposed to correspond with the earliest rudiments of European civilization.

MAINE-ET-LOIRE, a N. W. department of France, comprising most of the former province of Anjou, bordering on Mayenne, Sarthe, Indre-et-Loire, Vienne, Deux-Sèvres, La Ven-

dée, and Loire-Inférieure; area, 2,750 sq. m.; pop. in 1872, 518,471. It belongs to the basin of the Loire, by which it is annually inundated; the other principal rivers are the Maine, Loir, Sarthe, Mayenne, and Oudon. The surface is almost level, with slight undulations, and the soil very fertile, producing grain, wine, and fruits. Iron is found, and slate quarries are extensively worked. It has excellent breeds of cattle and horses. The principal manufactures are of linen, especially table linen and handkerchiefs, flannels, and cotton. It has a considerable trade in grain, wine, brandy, and cattle. It is divided into the arrondissements of Angers, Baugé, Cholet, Saumur, and Segré. Capital, Angers.

MAINE DE BIRAN, François Pierre Gonthier, a French metaphysician, born at Grateloup, near Bergerac, Nov. 29, 1766, died in Paris, July 16, 1824. He entered the body guard of Louis XVI. in 1784, and was at Versailles during the tumults of Oct. 5 and 6, 1789, but lived in retirement during the revolution. In 1797 he was chosen to the council of 500, from which he was excluded on suspicion of royalism, and under the empire became sub-prefect of the department of Dordogne at Bergerac, and a member of the legislative body. In 1813 he was one of the commission appointed to draw up an address to the emperor, which for the first time manifested a decided opposition to his policy. After the restoration he was re-elected to the chamber of deputies, became a councillor of state in 1816, and from 1818 retained his seat in the legislature, in which he constantly maintained the prerogatives of the crown. In a memoir entitled *Influence de l'habitude sur la faculté de penser*, which obtained the prize of the institute in 1803, he prepared for his departure from the reigning philosophy of Condillac by maintaining a distinction between active and passive mental habits, according to which the mind is active in perception and passive in mere sensation. In his second memoir, *Sur la décomposition de la pensée* (1805), he abandoned the effort to give a physiological origin to thought, suggested that sensation could not furnish the active and motive element in man, and was disposed to admit a principle of intelligence distinct from the organism. This work was rapidly followed by others, the most important of which was the *Examen des leçons de M. de Laromiquière* (1817), in which he completely passes from sensational to spiritual philosophy, and develops his own system, which caused Royer-Collard to say of him: "He is the master of us all." A complete edition of his works was edited by Cousin (4 vols., Paris, 1841).—See Naville, *Maine de Biran, sa vie et ses pensées* (Paris, 1857).

MAINTENON, Françoise d'Aubigné, marchioness de, second wife of Louis XIV. of France, born in Niort, Nov. 27, 1635, died at St. Cyr, April 15, 1719. She was the daughter of Constant d'Aubigné and Jeanne de Cardillac, and grand-

daughter of Théodore Agrippa d'Aubigné, the Huguenot historian of his time, and the friend and companion of Henry IV. Constant d'Aubigné, after dissipating his fortune, formed a project for establishing himself in the Carolinas. His correspondence on this subject with the English government was discovered and treated as treason, and he was imprisoned in the château Trompette at Bordeaux, of which his father-in-law was the keeper. After the death of the latter he was removed to the conciergerie of Niort, his wife voluntarily sharing his imprisonment, and there Françoise was born. In 1639 Constant d'Aubigné was discharged from prison, and with his wife and children emigrated to Martinique, where for a while he prospered; but he gambled away what he acquired, and died in 1645 in complete poverty. His widow with her children returned to France, and Françoise was confided to the care of her father's sister, Mme. de Villette, a Calvinist, who trained her in the principles of the Protestant faith. Mme. d'Aubigné, alarmed at her daughter's refusal to attend mass, procured an order restoring the girl to her own custody, and placed her as an inmate, in a dependent and almost menial position, in the house of her godmother, the countess de Neuillant, who after a while, and with some difficulty, converted her from Calvinism to Catholicism. The comic poet Scarron, who was paralytic and a cripple, lived in the same street with the countess de Neuillant, became interested in the young, beautiful, and intelligent girl, whose adventures had been related to him, and offered money to enable her to enter a convent, which poverty had hitherto prevented her from doing. Françoise refused the offer, and shortly afterward the countess de Neuillant placed her in an Ursuline convent, permitting her occasionally to visit her house, where she often met Scarron. Two years afterward, at the age of 16, she was without a home, her mother was dead, and she consented to become the wife of the deformed Scarron, to whom she was married in June, 1652. She was at this time exceedingly beautiful, graceful, and witty, and the house of Scarron soon became the resort of the most brilliant intellects of Paris. Scarron died in October, 1660, leaving his young widow nearly penniless, his pension ceasing at his death. Mme. Scarron petitioned for the reversion of her husband's pension, with small hope of success till Mme. de Montespan, the king's mistress, hearing of her destitution, interfered in her behalf, procured her an annual allowance of 2,000 francs, and in 1669 made her the governess of the children she had had by Louis XIV., much to the dissatisfaction of the king, who at first did not like the extreme gravity and reserve of the young widow. Her talents and wisdom, however, soon attracted his attention, and she became his confidant and adviser, was made a marchioness, and took the name of Maintenon from an estate at Versailles which the king purchased

for her. In 1680 she was appointed second lady in waiting to the dauphiness, and she influenced that princess to assist in bringing about a permanent separation between the king and Mme. de Montespan. The queen became much attached to Mme. de Maintenon, and died in her arms, July 30, 1683. Some time afterward the king, who had long and vainly solicited her to become his mistress, was secretly married to her at midnight in one of the cabinets at Versailles, Père la Chaise, the king's confessor, performing the ceremony, in the presence of Harlay, archbishop of Paris, Bontems, governor of Versailles, Louvois, and Montchevreuil, as witnesses. From this time till his death Louis was greatly under her influence, though her power over him was exercised with extreme prudence and moderation. She carefully shunned the appearance of meddling with the affairs of state, though in reality nothing was done without her knowledge and consent. It was at her instigation that the edict of Nantes was revoked and the Protestants persecuted. After the death of the king, in 1715, she retired to the convent and seminary of St. Cyr, which she had founded, and spent the rest of her life in acts of charity and in devotional exercises, which from earliest youth she had been accustomed scrupulously to observe.—See *Madame de Maintenon peinte par elle-même* (Paris, 1820), which contains her letters, and *Histoire de Mme. de Maintenon*, by the duke de Noailles (2 vols., Paris, 1848).

MAINZ. See **MENZ.**

MAIPURES, or **Maypures**, Indians of South America, chiefly on the upper Orinoco and Negro rivers. The family includes the Caveres or Cabres, who were nearly annihilated by the Caribs; the Guaypunabis, who under their chiefs Macapu and Cuseru stemmed the progress of the Caribs and made themselves masters of the upper Orinoco; the Pareni; the Maipures proper, among whom Gili labored and wrote, and who are now greatly reduced; the Moxos, who extended into Peru and Bolivia; the Meepure in Brazilian Guiana; the Kirrupa; and the Achaguas, a remote branch, residing on the Meta. These tribes were almost all cannibals and engaged in constant wars. The Moxos or Musus were conquered by the inca Yupanqui, and were thus to some extent brought within the influence of Peruvian civilization. They were the only tribe among whom Christian missionaries won any extensive conquests, though not without great sacrifices. In 1742, before their destruction by the Portuguese, the Moxo missions contained 30,000 neophytes. A grammar, vocabulary, and catechism of the Moxo, by Father Pedro Marban, were published at Lima in 1701; and a grammar of the Bauré, a Moxo dialect, by Antonio Megio, is still extant.

MAISONNEUVE, Jules Germain François, a French surgeon, who has been called the "Paracelsus of surgery," born in Nantes in 1810. He completed his studies in Paris, where he took his degree in 1835, and became prosecutor, lec-

turer, and surgeon to the principal hospitals, and latterly of the Hôtel-Dieu. He acquired celebrity by his bold and ingenious operations. His principal works are: *Du périoste et de ses maladies* (1839); *Sur la coxalgie* (1844); *Sur les kystes de l'ovaire* (1848); *Mémoires sur les hernies* (1852); *Mémoire sur une nouvelle méthode de cathétérisme* (1855); *Mémoire sur la ligature extemporanée* (1860); *Clinique chirurgicale* (2 vols., 1863-4); and *Mémoires sur les intoxications chirurgicales* (1867).

MAISONNEUVE, Paul de Chomedey, sieur de, first governor of Montreal, Canada, born in Champagne, France, died in Paris, Sept. 9, 1676. He entered the French army in his 18th year, and was esteemed alike for piety and bravery when he was selected as the leader of colonists sent out by an association. He sailed with them in three ships, and reached Quebec Aug. 20, 1641. Leaving the emigrants there, he went on to Montreal, and was installed as governor. The winter was spent in preparing timber for houses, and the actual settlement of the city began in May, 1642. Ten years later he returned to France, and brought over another body of settlers. His administration was marked by ability; he maintained great order and discipline in the settlement, organized the militia for Indian warfare, and acquired the respect of the hostile tribes. He retained office under the Sulpitians after the island was conveyed to them, but was removed in June, 1664, by De Mesy, the governor general, and sent back to France by the marquis de Tracy in the following year. The action was arbitrary, and no charges were made against Maisonneuve, who, finding that there was no hope of being restored to his post, resigned in 1669.

MAISTRE. I. Joseph, count de, an Italian statesman, born in Chambéry, Savoy, April 1, 1754, died in Turin, Feb. 26, 1821. His father was president of the senate of Savoy. After having studied at the university of Turin, he entered the magistracy in 1775, and became a member of the senate in January, 1788. The invasion of Savoy by the French in 1792 obliged him to retire to Turin; and when the king had to give up his possessions on the continent (December, 1798), De Maistre followed him to the island of Sardinia, where he was appointed grand chancellor. This office he retained till 1803, when he was sent as ambassador to St. Petersburg. He remained at the Russian court 14 years, and wielded for some time considerable influence over the czar Alexander. On his return to Turin (1817) he was appointed minister of state and regent of the grand chancery. He commenced his literary career with an *Éloge du roi Victor Amédée* (1775). In an early speech made at the opening of the senate he remarked: "Our age has distinguished itself by a destructive spirit which has spared nothing, neither laws, customs, nor political institutions; it has attacked all, shaken all, and the devastation will extend to limits which no one can as yet foresee." He wrote several works against the

revolutionary party in France, among which his *Considérations sur la France* (1796) had the greatest circulation. Notwithstanding the strictest prohibition, three editions appeared in Paris in one year. In 1810 he published at St. Petersburg an *Essai sur le principe générateur des constitutions politiques et des autres institutions humaines*, the object of which was to show that God is the immediate source of all authority upon earth, and every attack upon religion is a prelude to the destruction of social and political order. A translation of a work of Plutarch, *Sur les délais de la justice divine dans la punition des coupables*, with notes, appeared at Lyons in 1816. His most celebrated work is *Du pape* (Lyons, 1819). It treats of the pope from four points of view: 1, in his relation to the Catholic church; 2, to temporal sovereignties; 3, to the civilization and happiness of the nations; 4, to the schismatic churches. It is considered as one of the standard Catholic works in favor of the infallibility of the pope, which it infers from the necessity of an infallible authority in the spiritual order. Infallibility in the spiritual order is declared to be synonymous with sovereignty in the temporal order. From the same standpoint he attacked the Gallicans in the work *De l'Eglise gallicane dans son rapport avec le souverain pontife, pour servir de suite à l'ouvrage intitulé: Du pape* (Lyons, 1821). Among his other works are the *Soirées de St. Pétersbourg, ou Entretiens sur le gouvernement temporel de la providence* (2 vols., Paris, 1821), in which the justness of war and capital punishment is strongly advocated, and *Lettre d'un gentilhomme russe sur l'inquisition espagnole* (Paris, 1822). In his posthumous *Examen de la philosophie de Bacon* (Paris, 1836) he depreciates the English philosopher, and disparages critical philosophy in general. A very lively discussion was called forth by the publication of another posthumous work, *Mémoires politiques et correspondance diplomatique de Joseph de Maistre, avec explications et commentaires historiques*, by Albert Blane (2 vols., Paris, 1858-'60), many passages in which seemed not fully to agree with his other writings. De Maistre's son Rodolphe published *Quatre chapitres inédits sur la Russie, par le comte J. de Maistre* (Paris, 1859). **H. Xavier**, count de, a miscellaneous author, brother of the preceding, born in Chambéry in October, 1764, died in St. Petersburg, June 12, 1852. In early life he entered the military service of Sardinia, but upon the conquest of the country by the French he emigrated to Russia, and supported himself for some time by his pencil. After the arrival of his brother as ambassador in St. Petersburg, he was appointed in 1805 director of the library and museum of the admiralty. He soon afterward entered the Russian army as lieutenant colonel, and participated in the war against Persia, in which he obtained the rank of major general. He subsequently established himself in St. Petersburg, and devoted the remainder

of his life to literary and scientific pursuits. In 1794, being known then as a chemist and as a landscape painter, he published at Turin an ingenious philosophical trifle, entitled *Voyage autour de ma chambre*, which had great popularity, and of which numerous imitations of various degrees of merit subsequently appeared. In 1811 appeared *Les lépreux de la vallée d'Aoste* (translated into English, Philadelphia, 1825), a work founded on fact, and not less creditable to the author's literary capacity than to his humanity. It was followed by the *Prisonniers du Caucase, et Prascovie, ou la jeune Sibérienne* (translated into English, Philadelphia, 1826), both containing vivid and truthful pictures of scenery and manners in the eastern and southern provinces of the Russian empire. His popular *Voyage* was followed by *Expédition nocturne autour de ma chambre* (1825). An edition of his works was published at Paris in 1822, in 3 vols. 18mo.

MAITLAND, East and West, two contiguous towns of New South Wales, Australia, on the Hunter river, 75 m. N. of Sydney; pop. in 1871, 13,642, of whom about 2,000 belong to East Maitland. The surrounding region is among the most productive of the globe, and is commonly called the granary of New South Wales. Maitland is the seat of a Roman Catholic bishop, and there are numerous places of worship of nearly all religious denominations. East Maitland has a court house and a jail; West Maitland many large stores and some good hotels. Two newspapers are published, one of which, "The Maitland Mercury," is the oldest provincial journal in the colony. There is daily communication by railway to Newcastle, and by steamboat thence to Sydney.

MAITLAND, Sir Richard, of Lethington, a Scottish lawyer and poet, born in 1496, died March 20, 1586. He was educated at St. Andrews and in Paris, became an advocate, held several public offices, among others that of lord privy seal, and was knighted. He was the author of a "History and Chronicle of the House of Seaton," and of several poems, the most important of which is that on "The Creation and Paradyce Lost." A complete edition of his poems was first published by the Maitland club in 1830. He is celebrated as a collector of ancient Scottish poetry. His collections are yet extant in manuscript in the Pepysian library, Cambridge, and fill two large volumes. He became blind in 1559.

MAITLAND, Samuel Roffey, an English clergyman, born in London in 1792, died at Lambeth palace, London, Jan. 19, 1866. He graduated at Trinity college, Cambridge, studied law, and was called to the bar at the Inner Temple. He afterward studied theology, took orders in 1821, and became perpetual curate of Christ's church, Gloucester. He resigned this charge in 1830, and thereafter turned his special attention to literature. In 1838 he was appointed librarian to Dr. Howley, archbishop of Canterbury, and keeper of the Lambeth manu-

scripts, which office he held till the death of the archbishop in 1848. He was for several years editor of the "British Magazine," to which he contributed a large number of valuable essays and dissertations, chiefly on subjects of prophecy and its right interpretation, church history, criticism, &c. His principal works are: "An Inquiry into the Grounds on which the Prophetic Period of Daniel and St. John has been supposed to consist of 1260 years" (1826); "Letters on the Voluntary System" (1837); "The Dark Ages, being a series of Essays intended to illustrate the state of Religion and Literature in the 9th, 10th, 11th, and 12th Centuries" (1844; 3d ed., 1853); "Essays on the Reformation in England" (1849); and "Ervin, or Miscellaneous Essays on Subjects connected with the Nature, History, and Destiny of Man" (1850). He also prepared an "Index of such English Books printed before the year MDC. as are now in the Archiepiscopal Library at Lambeth," which was printed, but not published.

MAIZE, or Indian Corn (*zea mays*), a valuable grass of the tribe of *phalarideae*. The stems, unlike those of most grasses, are solid, with well defined nodes, and often producing from the lower nodes aerial or prop roots, some of which reach the soil; on the portion of the stem between the nodes is a broad shallow channel upon alternate sides; the stem is simple above, but often produces branches, or suckers, from the lower joints. The long linear-lanceolate leaves are flat, pointed, pubescent above, and with a broad midrib channelled on the upper side; sheaths smooth, downy on the margins, with a short ligule. The inflorescence is monœcious,



Maize.

the staminate flowers in clustered spikes at the summit of the stem, forming what is called the tassel; the spikelets are two-flowered, each floret having three stamens; the pistillate flowers are in dense spikes crowded upon a rachis, the cob; these are enveloped by the

sheaths of altered leaves, the husks; the whole pistillate spike is called the ear, and appears at the axils of the leaves; each pistillate spikelet is two-flowered with one flower abortive; when the grain is ripe the withered glumes, abortive flower, and palea remain upon the cob as the chaff; the ovary is terminated by a long hair-like style, which projects beyond the husks, and is usually bifid at the extremity; these styles together are the silk; after fertilization the ovary enlarges to form the grain and the styles wither; the grain is usually flattened by crowding, wedge-shaped or round-kidney-shaped, with a shallow groove containing the embryo. In the different varieties from one to four pistillate spikes or ears are borne by each stalk, though rarely more than two, and the number of rows of kernels varies from 8 to 12 or more, but they are always in even numbers. It is not rare to find abnormal specimens in which pistillate flowers are borne upon the tassel, where they perfect their grain, and the end of the cob is sometimes prolonged and furnished with staminate flowers. The maize plant is affected in a remarkable degree by climate and soil; it soon adapts itself to a locality, and by continuous cultivation from the same seed year after year, a local variety or strain becomes established. Though all the kinds of maize in cultivation, at least in the United States, are regarded as of one species, the varieties are almost endless; these are produced not only by local influences, but by selection; it is one of the species in which any peculiarity may be readily fixed in a few years by carefully selecting and sowing seeds from those plants which have the desirable features most strongly marked. In respect to size, there are varieties from 2 or 3 ft. high up to 15 and 18 ft., with the stalks and leaves large in proportion; the ears vary greatly in size and number of rows of kernels, which sometimes reach 24, 32, or more. There is a great difference in the form and size of the grain; a miniature kind, known as Brazilian, has ears about the size of one's little finger, with grains not larger than a mustard seed; while at the other extreme are the large southern varieties with kernels half an inch long. In the variety called rice pop-corn the kernels are pointed at both ends and but little compressed, and in the dent varieties there is a distinct depression at the upper end of the grain; in some the grains have a sharp hook at the end. In one variety, which has been described by Bonafous as a distinct species, *Z. cryptosperma*, the floral envelopes of the pistillate flowers, instead of being as is ordinarily the case in a rudimentary or imperfect condition, are fully developed, and enclose the grain when ripe in a miniature husk; this variety has been considered as the primitive type, but it is said to lose its husky envelopes in cultivation; neither this nor any other form of maize has been found in the wild state. The grains of maize present a great variety in color, from

white through various shades of yellow to orange, red, brown, violet, purple, and black; by the crossing of varieties kernels of two or more colors in stripes and blotches are produced. In the Tuscarora and some others the grain is dull and opaque, while in the so-called flint varieties the mass of the grain, the albumen, is translucent; the opaque kinds are very starchy, while the others contain large proportions of fatty matter. In the varieties known as sweet corn the grain is very much wrinkled and shrivelled; in these the conversion of sugar into starch is arrested, and the kernel does not fill out. A well developed stalk of maize is a most beautiful object; it has a stately sub-tropical aspect, and were it not so common it would be prized with us, as it is in some parts of Europe, as an ornamental plant. A few years ago Mr. Thomas Hogg sent from Japan a very distinct variety (if not species), in which the leaves are finely striped with white, and when young often with a tinge of red; the plant is only about 4 ft. high, but is very leafy, and retains its markings all through the season; it at once became popular in England, but is less frequently seen in our gardens than its merits deserve.—Some writers, including Bonafous (*Histoire naturelle du maïs*, Paris, 1836), have attributed an eastern origin to maize, and the subject has been the occasion of much discussion; the matter has been thoroughly examined by Alphonse de Candolle (*Géographie botanique raisonnée*, Paris, 1855), who sums up thus: "Maize is of American origin, and was not introduced into the old world until after the discovery of the new." It was found in cultivation by the aborigines from New England to Chili; varieties not now in cultivation in Peru have been found in tombs of an antiquity greater than that of the Incas; and Darwin ("Geological Observations on South America," London, 1846) discovered "heads of maize, together with 18 species of recent sea shells, imbedded in a beach which had been upraised at least 85 ft. above the level of the sea."—It is estimated that maize is eaten by a greater number of human beings than any other grain except rice; its analysis shows it to be admirably adapted to sustain life, and to furnish materials for the growth of both human beings and domestic animals. Recent analyses show the following percentage of nutritive principles: albuminoids (flesh-forming materials), 10 per cent.; carbohydrates (starch, sugar, &c.), 68; fat, 7. The amount of ash is a little over 2 per cent., and this contains a large proportion of phosphoric acid in combination with lime and other bases. The amount of fatty matter or oil is notable, varying with the kind of corn from 6 to 11 per cent.; the hard flinty varieties of northern localities have the most, and the starchy kinds the least; wheat contains only about 1½ per cent. of fatty matter. It will be seen that maize is a highly concentrated nutriment, and is capable of serving, as it does in some tropi-

cal countries, as almost the sole food of the population; it is more difficult of digestion than some other grains, and where, as in Central and South America, it is the chief food of the common people, they almost invariably accompany it with capsicum, in the form of *chili colorado* or *chili verde*, as a stimulus to the stomach. While maize furnishes a large share of the breadstuff of our farming population, it is but little consumed in cities, except to give variety upon the table; but indirectly it largely contributes to the support of city populations in the way of meats, poultry, butter, &c. In the unripe state maize in the form of "green corn" is a generally esteemed vegetable, and the quantities daily supplied during the season to cities are enormous; the varieties already alluded to as sweet corn are in the northern states raised exclusively for eating in the green state; the ears are plucked while the contents of the kernels are still milky. A large business is done in preserving this kind of corn in tin cans for use when it cannot be had fresh, and large quantities are dried, being first boiled and then cut from the cob. The favorite dish called succotash consists of unripe beans and green corn cooked together, and in winter it is made from ripe beans and dried sweet corn. One of the primitive methods of preparing the ripe grain for food is to soak it in lye from wood ashes to remove the pericarp or hull; the grain in this process becomes softened, and after washing to remove the lye it is crushed into a paste upon an inclined stone by rubbing it with a smaller long and narrow stone; the resulting dough is then patted into thin cakes and quickly baked upon a tile or iron plate; these cakes are the *tortillas* of the Mexicans and other Spanish Americans, and it is probable that this method of preparing corn is of great antiquity, as the *metatl*, or stone for grinding, is found among ruins so old that all tradition respecting them is lost. Another simple method of preparing corn in use by the Mexicans is as *pinole*; the grain is roasted, then ground to a coarse meal, which is mixed with sugar and spices; this is stirred with water to form a sort of gruel, and the grain being already cooked, it is very nutritious; pinole is often the sole provision carried by travellers on long journeys, and forms an important part of the rations of the soldiers. The hull may be removed from the grain by beating; this is done by hand in a wooden mortar, or on a large scale by machinery; corn thus prepared is called hominy and samp, names derived, with the method of preparation, from the aborigines; in the northern states samp is the whole decorticated grain, and hominy that which is broken or coarsely ground, a distinction not made at the south; these preparations of corn are cooked by boiling. Hulled corn is the grain from which the hull has been removed by the use of lye, then thoroughly soaked, and afterward boiled until tender. In the form of meal maize is largely

consumed, it being made into a great variety of bread and cakes, conspicuous among which is the New England brown bread, in which rye meal is mixed with the corn meal in the proportion of one third. Hasty pudding, the praises of which were celebrated in verse by Barlow, is a mush or strabout of Indian meal and water; this, eaten with milk, is an exceedingly cheap and nutritive food. In some localities only the flinty kinds of corn are used for meal, while in others the starchy varieties are preferred. Several varieties are known as pop-corn, of which there are white and yellow kinds, those with kernels pointed at the end, and others with the grain of the ordinary shape; when gradually exposed to heat over a brisk fire, the oil in the grain becomes converted into gas, which at length ruptures the grain, causing a singular inversion of its contents; the corn thus popped is many times larger than the original grain, and snowy white; as an article of food it is much prized by children and others, and the preparation of it is one of the small industries which in the aggregate amount to a respectable sum. Corn is sometimes used as fuel; upon prairie farms where there is no wood, and at long distances from a market where corn can be sold and coal bought, it becomes the cheapest obtainable fuel; the cobs after the corn has been shelled from them are in general use as fuel, and farmers prefer them to any other to burn in smoke houses, as they think meat thus cured is better flavored than if wood is used; a pipe with a bowl made from a corn cob is a favorite with many smokers. Besides the uses of the grain, the stalks and leaves are of great value as cattle fodder; the old plan was to top the corn when the grain began to ripen by cutting off the stalk above the upper ear, and to strip off the leaves from the rest, and this is still done by some old-fashioned cultivators; the improved method is to cut up the stalks at the ground as soon as the grain begins to harden, or is "glazed," tie them in bundles, and set these up in the field in large stooks; treated in this way, the corn ripens thoroughly, and all the fodder is saved in an excellent condition. Corn stalks are cut for feeding, and if cut and steamed they are considered equal in value to the common kinds of hay; one ton of stalks is yielded on the average for every 25 bushels of grain. Corn is often sown for the sake of a crop of fodder only; in this case no regard is had to the grain, and the seed is sown thickly and the corn allowed to stand close in order to produce a more succulent crop; it is cut as soon as the tassels open, and cured in small bundles. Large quantities of corn are grown in this manner to be used as green forage; the plant flourishes best in the hot summer months, the time when pastures begin to fail. On dairy farms a field of fodder corn is of great importance in keeping up the supply of food; the stalks are cut and fed to the animals in their stalls.—Among the miscellaneous uses which the maize plant has

served is the manufacture of paper; an Austrian, Von Welsbach, invented a process by which the fibre of the stalks, leaves, and husks could be converted into paper; a few years ago specimens of various grades, from the coarsest to the finest papers, were exhibited in this country, but the manufacture does not appear to have extended. The juice of the stalk before the grain ripens is appreciably sweet, and both sirup and sugar have been obtained from it; the process of clarifying appears to be a difficult one, and for sirup the maize cannot compete with sorghum. The starch of the grain is converted into grape sugar, which in the form of a thick honey-like sirup is used by brewers and wine makers. As with all other forms of starch, that of maize, being capable of conversion into sugar, is by one more step capable of producing alcohol, and whiskey must be mentioned as one of the incidental products of the corn crop. The starch of maize when examined with the microscope is found to be of irregular grains with many sides, the result of mutual compression, having a distinct hilum; the grains are only about one fourth as large as those of potato starch. Corn starch carefully prepared is much used in delicate cookery for puddings and the like; a similar preparation is largely sold under the name of "maizena." The oil furnished by corn has been found excellent for illuminating purposes, but on account of the expense of extracting it is not likely to come into general use. The husks, or shucks as they are called in some localities, are put to many domestic uses; slit into shreds they are used for filling mattresses, both by farmers and upholsterers; large quantities are prepared at factories in the southern cities, and they form a regular article of commerce; by selecting the more delicate inner ones and plaiting them, table mats and other fancy articles, and even bonnets and slippers, have been made from them; coarser ones are braided to form door mats, horse collars, and other wares.—In America corn is cultivated from lat. 54° N. to 40° S., and in the eastern hemisphere from the Azores to southeastern Europe, some being raised in Asia Minor, Egypt, India, and China. The early colonists of this country soon learned its uses and manner of cultivation from the Indians; large crops were raised on the James river as early as 1608, and it has continued to be one of the most important of our agricultural products.* In the older states it is a question with agriculturists whether corn is a profitable crop to raise simply for the grain; upon poor lands it requires abundant manuring, and clean cultivation is essential to its success. In a rotation it is of great value as a cleansing crop; *i. e.*, the cultivation it demands leaves the land in excellent condition for whatever crop is to follow. Upon the rich lands of some of the western states the grain can be raised at a surprisingly low cost; the great fertility of the soil allows crops to be taken year after year without manure, and every mechanical appli-

ance is brought into play to reduce the cost of cultivation; corn planters and sulky cultivators allow one man to manage many acres; and now machinery has been invented to save the grower from the most irksome task of husking; and where the corn is sold in the shape of beef and pork, the animals are turned into the field and made to do their own harvesting. In planting, the seed is put in hills or in drills, the distance apart being governed by the kind of corn and the richness of the soil; each method of planting has its advocates; if the land is full of weeds, it is said that these can be more readily kept under if the corn is in hills, to allow of cultivation by plough or cultivator in both directions. By hill, an elevation is not to be understood, but it is used to express the station for the plants; the old practice of hilling, or drawing the earth up to form a mound around the plants, is abandoned by good cultivators. The cultivator has numerous enemies to contend with; crows and blackbirds will take the seed when sprouting, or even before it starts, and to prevent this a thin coating of tar is sometimes applied; cutworms take off the young shoot above ground, and the white grub eats the roots below; the chief remedy for these is to sow enough seed to allow for their depredations. The boll worm, so destructive to cotton, also attacks corn, even in the northern states; the moth lays her eggs upon the silk, and the young larva soon finds its way beneath

it attacks the growing grain; a single kernel will sometimes be found transformed into a soft grayish fungoid mass, as large as an egg or larger; this when broken open will be found to contain a blackish powder, the spores. This is not only destructive to the corn, but dangerous to the animals which eat it; the death of animals has been directly traced to feeding on corn stalks badly affected with smut, and it is said that mules fed upon corn thus diseased lose their hoofs, and that it produces abortion upon cows; it seems to have properties similar to those of the ergot of rye.—According to the federal census, the United States produced 592,071,104 bushels of Indian corn in 1850, 838,792,742 in 1860, and 760,944,549 in 1870. The states which produced more than 14,000,000 bushels in 1870 are as follows:

Alabama.....	16,977,948	Missouri.....	66,094,075
Georgia.....	17,646,459	New York.....	16,462,825
Illinois.....	129,921,395	North Carolina...	18,454,215
Indiana.....	51,094,588	Ohio.....	67,501,144
Iowa.....	68,935,065	Pennsylvania.....	34,702,006
Kansas.....	17,025,525	Tennessee.....	41,343,614
Kentucky.....	50,091,066	Texas.....	20,554,583
Michigan.....	14,086,233	Virginia.....	17,649,304
Mississippi.....	15,837,316	Wisconsin.....	15,033,993

During the year ending June 30, 1873, 38,541,930 bushels of Indian corn, valued at \$23,794,694, were exported from the United States, chiefly to Great Britain, besides 403,111 bushels of meal, worth \$1,474,827. In 1872 the total import of Indian corn into Great Britain, chiefly from the United States, amounted to 24,532,670 cwts., valued at £8,691,192.—For a full discussion of the origin of maize, see De Candolle, *Géographie botanique*, quoted above. A description of the leading varieties is given in Fearing Burr, jr.'s "Field and Garden Vegetables of America" (Boston, 1865). A full and exhaustive treatise is Edward Enfield's "Indian Corn, its Value, Culture, and Uses" (New York, 1866).

MAJESTY, a title of the highest honor, first used by the Romans to designate the supreme power and dignity of the people (*majestas populi Romani*), as well as of its highest chosen representatives or rulers, as dictators, consuls, and the senate. On the overthrow of the republic, the emperors assumed the same title (*majestas Augusti*), and in the middle ages it was adopted by the German emperors. Of kings, it was given to Louis XI. of France in 1461, and Henry VIII. of England assumed it in 1520. When Charles V. was elected emperor of Germany in 1519, he took the title also as king of Spain. It is now generally bestowed on all emperors and kings of Europe, except the sultan, who is styled highness, as well as on the emperor of Brazil. The emperor of Austria is addressed as imperial and royal apostolical majesty. The titles of Catholic majesty and most Christian majesty were bestowed by the see of Rome on the kings of Spain and France respectively. James I. of England used the style "sacred" and "most excellent majesty." Violations of the majesty



Corn Smut.

the husks, where it revels upon the tender kernels. The most serious enemy to the crop is not an insect but a fungus, *ustilago maydis*, which produces what is known as smut; it manifests itself by abnormal growths upon various parts of the plant, but more frequently

of the people, as for instance treason, were termed by the Romans *crimina læsa majestatis*, a term also used of violations of monarchical dignity.

MAJORANO, Gaetano. See CAFFARELLI.

MAJORCA (Span. *Mallorca*), the largest of the Balearic islands, in the Mediterranean, belonging to Spain, about 120 m. S. S. E. of Barcelona, between lat. $39^{\circ} 15'$ and 40° N., and lon. $2^{\circ} 20'$ and $3^{\circ} 30'$ E.; length from E. to W. nearly 64 m., breadth in some parts 40 m.; area, about 1,300 sq. m.; pop. about 230,000. On the N. E. coast are the large bays of Puerto Mayor and Puerto Menor, and on the S. E. that of Palma; and there are several good natural harbors. The northern half of the island is covered by mountains, the highest of which is upward of 5,000 ft. above the sea. The southern half is comparatively level. The rocks are generally of secondary or tertiary formation. There are five or six small rivers, and the hills and plains generally are well supplied with small streams, though in some of the plains the want of water makes cultivation difficult. The principal river, the Riera, rises at the foot of Mount Puigpunent and falls into the sea at Palma. The climate is temperate, the thermometer in summer ranging only from 84° to 88° , while that of winter seldom falls below 48° . The island produces marbles of great beauty and variety, 36 different specimens of which were exhibited at Vienna in 1873, and also slate, granite, syenite, porphyry, and some coal and iron. Lavender, rosemary, thyme, marjoram, saffron, marsh mallow, jonquil, and wild celery are the commonest vegetable productions. The island affords abundant pasturage for large numbers of horses, mules, cattle, sheep, goats, and swine. The sheep are large, and produce great quantities of fine wool. Game of the smaller kind, such as hares, rabbits, quails, and partridges, is very plentiful; and the preserving of thrushes as well as of fish is an important industry. There are scarcely any venomous animals. The soil is exceedingly fertile, but the agricultural skill of the islanders is imperfect. Wheat, barley, oats, hemp, flax, and silk are produced in considerable abundance, and the fruits include oranges, lemons, citrons, dates, figs, and pomegranates. The olive crop yields yearly 650,000 gallons of oil. The people manufacture a considerable quantity of woollen stuffs, not only for their own use, but for export to Spain, Malta, Sardinia, and America. Other important manufactures are hats and fine cabinet ware. New factories have recently been constructed for the production on a large scale of canvas, rope, and cordage, fibre for which is now imported from Manila; the Spanish navy was lately supplied entirely with rope made at Palma. The island, which in earlier days gave its name to majolica ware, now only produces very common pottery. The wines are excellent, and are largely exported, as are also brandy, oil, figs, and oranges. The total value of

the exports in 1873, including the coasting trade, was \$6,076,339. The principal towns are Palma, Soller, Manacor, Alcudia, Porreras, and Inca. Palma is the capital, the seat of a bishop and of the captaincy general of the Balearic islands. A railway to connect it with Inca and Alcudia is in progress. The natives resemble the Catalans in their appearance and manners, are remarkably honest and hospitable, and make excellent soldiers. The upper classes speak Castilian, but the lower orders use a dialect which is a mixture of Greek, Latin, Vandal, Arabic, Catalanian, and Languedocian words, representing the various races by which the island has been occupied.—Little is known of the early history of Majorca. There were Carthaginian settlements in it prior to 500 B. C. The Roman Q. Metellus conquered it A. D. 123, and the Vandals in 426. The Moors seized it in 798, and held it till 1229, when it was taken by James I. of Aragon, who erected it into a kingdom (including the other Balearic islands, the county of Montpellier, Roussillon, and Cerdagne) in favor of his son Don James, in 1262. It was finally annexed to Aragon in 1343. The island declared for Charles III. in the war of the Spanish succession; it rebelled against Philip V. in 1714, but submitted in July, 1715. It was thrice visited by epidemics—in 1865, 1870, and 1873—attended with frightful mortality. (See BALEARIC ISLANDS.)

MAKI. See LEMUR.

MALABAR, a district of British India, in the province of Madras, on the W. coast, between lat. 10° and $12^{\circ} 20'$ N.; area, 6,262 sq. m.; pop. in 1871, 2,274,463, of whom about 24,000 were Christians. It is bounded N. by the district of South Canara, S. by Cochin, W. by the Indian ocean, and E. by the Western Ghats, which are here 4,000 ft. and upward in height. Between these and the sea the country lies, extending about 150 m. along the coast, with an average breadth of 40 m. With trifling exceptions, a low sandy strip, from 1 to 3 m. broad, runs along the shore, and is covered with a continuous and luxuriant grove of cocoanut trees, to the cultivation and care of which the natives give the greatest attention. Behind this tract, hills of inconsiderable height come down from the mountain chain which forms the E. boundary. Between these hills there are valleys of extreme fertility, being the receptacle of the soil washed in the course of ages by the heavy rains from the surrounding eminences. The hills have level, or rather perfectly horizontal summits of naked rock, which is a peculiar characteristic of the face of the country. Many of them have steep sides, which are not unfrequently formed into terraces and cultivated. All the country that borders on the Ghats is covered with forests and dense jungle, belts and detached portions of which in places stretch to within a few miles of the sea. Malabar is watered by innumerable short streams. The chief river is the

Beypoor, which is with its tributaries navigable for boats of considerable size for about 30 m. inland; next to this is the Ponany river, which is longer, but shallower. Several inlets run along a short distance from the shore parallel to the coast, receive the mountain streams, and communicate with the ocean by shallow channels, and are navigable for small boats for nearly the whole length of the province. It is on the banks of the rivers and of these inlets, in the valleys, and along the coast, that the inhabitants reside. The climate is generally healthful, though in the interior jungle fever is prevalent at certain seasons. The hot season is from February to May, the wet from May to October, and the cool during the remainder of the year. The thermometer seldom rises above 90° in the shade, and rarely falls below 70°. During the wet season very heavy rain falls along the coast, increasing toward the interior; the average rainfall throughout the district is more than 75 inches per annum, and at Cananore it is 123 inches.—The principal vegetable productions of Malabar are pepper, coconuts, ginger, coffee, hemp, cardamoms, betel nuts, turmeric, arrowroot, sapan wood, sandal wood, timber of different sorts, and various gums and resins. Besides teak, 120 other kinds of valuable timber have been enumerated in a report upon the forests of Malabar. Since 1843 large plantations of teak have been made. Cardamoms are produced from the forest land on the face of the mountains which bound the province, at the height of from 2,000 to 4,000 ft. above the sea, growing spontaneously after the felling and burning of the trees. Pepper, which is the principal commercial product, and is styled the money of Malabar, is chiefly cultivated in the northern part, in the neighborhood of Tellichery, and thrives especially in the moist valleys of the Ghauts. The trailing plant from which it is produced requires but slight care, the cultivator having little more to do than collect the produce. The culture of coffee was introduced by British planters, on estates situated on the slopes of the mountains, some 2,000 ft. above the sea. The proprietary system of land revenue prevails, under which a percentage of the rent goes to the landlords and the rest to the government. Rice is grown throughout the province, but not in sufficient quantities for internal consumption. The cultivation of ginger, since its exportation to Europe began, has been carried on with great vigor. Iron is obtained from laterite in many places, and gold in small quantities is found in the mountain streams. Large herds of elephants and buffaloes frequent the interior forests. There are some tigers and numerous leopards, deer of various kinds, elk, bears, hogs, porcupines, squirrels, and monkeys. There are small bullocks, which, together with buffaloes, are used in tilling the ground; in the level tracts elephants are employed to drag timber to the rivers, to be floated to the coast. There are but few horses, and traffic is either carried on

by water or upon men's shoulders, as in China. —The population of Malabar is made up of Hindoos, Mohammedans, and Christians. There are a few Jews, both white and black, who are principally settled in the southern part of the district. The Brahmans, the highest class of Hindoos, are here called Namburis; to limit the numbers of their race, they prevent the younger sons from marrying. There is another caste of Brahmans called Puttar, who are much more numerous. The next in rank are the Nairs, who are of 11 castes, of various ranks and professions, but all pretend to be born soldiers. Their habits and manners are marked by some strange peculiarities, among which may be mentioned the want of that penurious disposition natural to other Hindoos, and their utter disuse of marriage. A girl on reaching the age of puberty forms any connection she thinks fit; and the children, who have no claim upon their natural father, become the heirs of her brothers. The Tiars, or Theans, are considered next in rank to the Nairs, and are engaged in various occupations, but principally in cultivating the ground. The Poliars, or Chermars, are a numerous class, who, before the British interfered in their behalf, were held in slavery, and bought and sold separately or along with the land. The Niadis are the lowest specimens of all, and are outcasts considered so impure that even a Chermar would be defiled by their touch. They wander about in companies of 10 or 12, keeping at a little distance from the roads, and upon seeing a traveller set up a cry for assistance. They refuse all labor, subsist upon roots and any food however loathsome, and live in wretched huts built in secluded spots. The Chermars and Niadis are supposed to be the descendants of the aboriginal inhabitants of the country, and are much smaller in stature and darker in complexion than the Brahmans, Nairs, or Tiars, who are all of good height and well formed, with remarkably handsome features and olive-colored complexion. The native Mussulmans, denominated Mapilas, form about one fourth of the population. They are descended from Hindoo mothers by Arab fathers, who settled in Malabar about the 7th or 8th century, and are exceedingly fanatical and treacherous. There are some Syrian Christians toward the S. boundary of the province, who consider themselves descendants of converts made by the apostle St. Thomas in the 1st century (see CHRISTIANS OF ST. THOMAS); and also a few thousand converts to Christianity and descendants of the Portuguese, who reside chiefly in the neighborhood of their ancient settlements. —The Hindoo population of Malabar are not prone to congregate in towns and villages, but for the most part live in separate houses, neatly built and kept scrupulously clean, throughout the country. The towns owe their origin entirely to foreign settlers, and the chief are Calicut, Palghat, Tellichery, Cananore, Mahé (which is a French colony), and Ponany. At

Beypoor, 7 m. S. of Calicut, where the river of the same name falls into the sea, is the terminus of a railway connecting Madras with the coast of Malabar. The attempts of the English to manufacture iron here have not been successful. Many ships have been built at Beypoor, for the construction of which the forests situated on the banks of the river supply teak timber of a darker color and better description than is found elsewhere, and of very large size. It was at Beypoor, and not at Calicut as generally supposed, that the first European navigator, Vasco da Gama, landed in 1498. At that time the Portuguese established themselves in Malabar, and the Dutch made some settlements there in 1663. The exports of Malabar amount in value to about \$3,000,000 per annum. They consist chiefly of cocoanuts and coconut oil, coir rope, arrack, betel nuts, coarse cotton cloth, pepper, ginger, cardamoms, camphor, coffee, kino, and various gums and resins. The imports do not amount to more than one third of the value of the exports.—The name Malabar is supposed to be a corruption of the Indian *malayalam*, signifying skirting the hills, and the original Sanskrit name is said to have been Kerala. It is supposed that the country was conquered in very early times by a king from the opposite side of the mountains, and that the Nairs came at the same time as a military body. They took every opportunity to aggrandize themselves, and continued to rule the country till Hyder Ali invaded it in 1763. Hyder subdued the country, plundered it almost to exhaustion, and expelled all the rajahs except such as conciliated him by immediate submission. His son Tippoo Sahib proposed to the Hindoos to embrace the Mohammedan faith, and followed up his proposition by levying large contributions on his infidel subjects, and forcibly circumcising many of the Brahmans, Nairs, and others. On the breaking out of the war between Tippoo and the British in 1790, the refractory Nairs, many of whom had fled to the forest to escape his persecution, joined the latter and succeeded in driving him from the country. With some slight disturbances, Malabar has since remained a portion of British India. It was incorporated with the Madras presidency in 1803, and since then the population has more than quadrupled, and the country is steadily advancing.

MALABAR COAST, an indefinite term applied to the W. side of the Indian peninsula. In a somewhat restricted sense it means the coasts of Concan, Canara, Malabar proper, Cochin, and Travancore. The coast of Malabar proper is about 150 m. in length, and has numerous harbors, though most of them are so shallow as to be available only to vessels of light draught and coasters.

MALACCA. 1. A British territory, one of the Straits Settlements, on the W. side of the Malay peninsula, between lat. 2° and 2° 30' N., extending 42 m. along the coast, and varying in

breadth inland from 14 to 24 m.; area, 658 sq. m.; pop. in 1870 (estimated), 67,267, of whom 2,648 were white. The territory lies in an irregular triangle, the S. E. boundary or base of which is formed by the Cassang river, which rises near a remarkable conical hill named Mt. Ophir, about 50 m. E. of the capital. In the interior the country is arranged in a series of undulating hills and valleys, generally lying parallel to the seacoast. There are no great ranges of hills, but a large number of detached elevations are found, varying in height from 100 to 1,000 ft. Mt. Ophir, called by the natives Ledang, is the only considerable elevation; it rises to the height of about 5,000 ft. above the level of the sea. The general formation of these hills and of the territory is granitic, with a covering of laterite, or red clay ironstone. The coast line may be divided into three portions of distinct character. The N. W. portion, from Lingie river to Tanjong Kling, 17 m., shows a bold wooded elevation reaching to the sea. Behind this coast plateau the series of hill and valley commences immediately. The central portion, or from Tanjong Kling to the town of Malacca, 5 m., is a sandy beach, with ferruginous rocks, appearing in points jutting into the sea. The third part, 21 m., is a mud flat, exposed for a great distance at low water; and the inner portion is covered with mangrove jungle. Inland from the two latter portions, an immense alluvial plain, with detached hills, extends considerably beyond the inner boundary of the territory. The district is watered by five navigable rivers, of which the Lingie is navigable for vessels of 200 tons as far as Simpang, a distance of 8 m. Numerous smaller streams fall into the sea. The soil of the low lands is a rich alluvium, varying in color from light brown to red. The territory is capable of producing in perfection almost every article of intertropical culture, and of late years the forests have been cleared away to a considerable extent, and agriculture is on the increase. It enjoys the equable temperature and salubrious climate of the Malay archipelago, to which it geologically and ethnologically belongs. The greatest recorded range of the thermometer is from 68° to 86°.

—Tigers, leopards, black panthers, and other ferocious animals abound. Among the other animals are monkeys of various species, the elephant, rhinoceros, buffalo, wild ox, tapir, several species of deer, the antelope, and musk deer. The chief crops are rice, the coconut, and tapioca. Nutmeg plants have been brought from the Moluccas, and cultivated with moderate success. Cinnamon, of superior quality to that of Ceylon, is cultivated for exportation. Cotton, chocolate, sugar cane, indigo, and a great variety of fine fruits are raised. Among the exports are tin, known in commerce as "straits tin," ebony, ivory, rattans, lac, eagle wood, hides, hogs, and fowls. Gold is washed from the sands of all the streams in fine dust. The trade is chiefly with

the neighboring British settlements, Penang and Singapore. The annual exports amount to about \$2,000,000, and the imports to about \$2,250,000. (See MALAY PENINSULA, and STRAITS SETTLEMENTS.) II. A city, capital of the territory, situated near the mouth of a small river which falls into the straits of Malacca, in lat. 2° 14' N., lon. 102° 12' E.; pop. about 15,000. It was the chief emporium of oriental commerce before Europeans visited the Indian seas. The Arabs, Persians, and Hindoos resorted to its port to procure the spices, gums, and other precious products of the Malay archipelago, which they afterward distributed throughout Asia, Africa, and Europe. It owed its commercial distinction to the freedom of its roadstead from hurricanes or the influence of the monsoons, and to its advantageous situation in the straits of Malacca, the great highway of eastern commerce. It is a free port; but its trade has long ceased to be of any relative importance, and is almost entirely confined to the neighboring settlements. The harbor is too shallow to admit large vessels. When first visited by the Portuguese, it contained about 35,000 dwellings, and, according to the lowest computation made at the time, 150,000 inhabitants. It was besieged and taken by Albuquerque in 1511. The victor captured more than 3,000 pieces of brass and iron cannon, mounted upon the walls of the city, which were said to be superior to any of Portuguese fabrication of that period. The Portuguese held possession of the city for 130 years, and during that period it underwent 19 sieges, 8 of which were undertaken by the Malays, chiefly of the state of Achecn, and the rest by the Dutch, who captured the place after nine months' siege and blockade in 1641. The Dutch held the city for 154 years, surrendering to a British besieging force in 1795. In 1818 it was restored to the Dutch government; but it again reverted to the British in 1824, in exchange for Bencoolen in Sumatra. There are many notable ruins of fortifications constructed by the ancient Malay kings, and many of their tombs; also ruins of monasteries, churches, and fortifications constructed by Albuquerque, including those of the monastery of Madre de Dios, on a hill in the rear of the town, which contained the remains of St. Francis Xavier till they were transferred to Goa.

MALACCA, Straits of, the waters which separate the Malay peninsula from the island of Sumatra. This channel is the most frequented route of European vessels proceeding eastward to Chinese and neighboring points; and it is also in the line of Australian and Malaysian communication with continental India. It enjoys with the Malaysian seas an entire exemption from the hurricanes and typhoons which prevail in the neighboring waters to the eastward and westward. Two lighthouses constructed by the British government, at the N. W. and

S. E. extremities, contribute greatly to the safety of its navigation. The channel is about 600 m. long, and from 80 to about 200 m. wide.

MALACHI, the last of the minor prophets. The name may be defined either "my messenger" or "messenger of Jehovah." Nothing is known of his person or history, and many interpreters, as Umbreit, Hengstenberg, and others, are of opinion that Malachi is not a proper name, but an official title; and some hold that Ezra was the writer of this book. From the contents of the prophecy it may be inferred that the prophet lived after Zechariah, since in his time the second temple was already built (iii. 10), and that he was contemporary with Nehemiah (446 B. C.). The prophet reminds Israel of the kindness of God toward them in the past, and complains of the irreligiousness of the priests and the people. He then announces the coming of a messenger sent by the Lord to prepare the way for him, and the coming of the Lord himself to judgment, which will be condemnation of the wicked and a blessing on the good. The prophecy of Malachi occupies the last place in the canon of the Old Testament, and is referred to in several places of the New Testament. Among the more important commentaries upon it are those of Hitzig, Ewald, Maurer, Umbreit, Pressel, and Reinke. The last, a Roman Catholic, has written the most complete work on this book, containing the Hebrew text and a translation, with a full critical, philological, and historical commentary (Giessen, 1856).

MALACHITE. See COPPER, vol. v., p. 319.

MALACHY, Saint, archbishop of Armagh, born in Armagh about 1095, died at Clairvaux, France, Nov. 2, 1148. He was of noble birth, became a monk, and was appointed vicar of St. Celsus, archbishop of Armagh, who destined him for his successor. He studied canon law under St. Malchus, bishop of Lismore, and rebuilt a portion of the monastery of Bencor. About 1127 he was appointed bishop of the united sees of Down and Connor. He visited on foot every hamlet in both dioceses, restored reverence for the matrimonial contract, repaired churches, established schools, obtained enlightened priests, and introduced everywhere the Roman liturgy and ritual. He became archbishop in 1129; but as the temporalities of Armagh had been confiscated, he continued to govern the diocese of Connor. This city was sacked in a civil war, and with 120 disciples he retired into Munster, built the monastery of Ibrach, and as primate made a visitation of Munster and Connaught. Toward the end of 1134 he took possession of the see of Armagh, completed his reforms, and made a second visitation of the dioceses of Munster. In 1137 he resigned his archbishopric, consecrated a bishop for Connor, and reserved for himself the poorer and obscurer see of Down, where he founded various institutions. In 1139 he went to Rome, to confer with the pope about

a thorough renovation of the Irish church, and received full power as legate *a latere*. After his return he visited every part of the island, and in 1148 held a national council at Inis Padrig or Patrick's Holme; disciplinary decrees were enacted, and a petition was drawn up for the establishment of two metropolitan sees. With these Malachy started for France, hoping to meet Pope Eugenius III. at Clairvaux; but he arrived there after the pope's departure, fell ill of a fever, and died in the arms of St. Bernard, who pronounced a panegyric at his funeral, and wrote his life (translated by Maffei). He was canonized by Clement III. in 1190, and his feast is celebrated on Nov. 3.—A "Prophecy concerning the Lives of the future Roman Pontiffs," beginning with Celestine II., elected in 1143, popularly attributed to St. Malachy, is now considered to have originated in the conclave of 1590. It was first published in 1595 by the Benedictine Arnould de Wyon, and is to be found in Moréri's *Dictionnaire historique*.

MALACOLOGY (Gr. *malakós*, soft, and *lógos*, discourse), that department of zoology which treats of the *mollusca*, some of which were termed even by Aristotle *malakia* (soft animals), including the examination both of the external shells and the internal organs. In the article **CONCHIOLOGY** the outer shells of mollusks have been sufficiently described, and their internal organization and habits will be noticed under **MOLLUSCA**; it only remains here to enumerate briefly some of the principal systems of classification. Linnæus (1766) placed mollusks in his 6th and lowest class of *vermes*, with worms and zoöphytes. As early as 1812 Olivier had given to the world his views on the classification of animals, founded principally upon his researches in comparative anatomy; he makes the mollusca his second branch, with the classes: 1, *cephalopoda* (like cuttle fishes); 2, *pteropoda* (like *clio* or whale bait); 3, *gasteropoda*, with orders *pulmonata* (slugs and snails), *nudibranchia* (naked marine genera without shells, like *doris*), *inferobranchia* (*phyllidia*), *tectibranchia* (*bulia* and *aplysia*), *heteropoda* (*carinaria*), *pectinibranchia* (most of the marine univalves, *turbo*, *trochus*, &c.), *tubulibranchia* (like *siliquaria*), *scutibranchia* (*haliotis*, &c.), and *cyclobranchia* (*patella* and *chiton*); 4, *acephala*, with orders *testacea* (oyster, clam, and most bivalve shells) and *tunicata* (ascidians); 5, *brachiopoda*, like *terebratula*, *erania*, and *lingula*; and 6, *cirrhopoda* (like barnacles), now placed among *articulata* in the class *crustacea*.—Lamarck (1815-'22) arranged the mollusks in two classes: one his 11th, *conchifera* or bivalves, with the orders *dimyaria* (having two separated muscular impressions on the inside of the shells) and *monomyaria* (with a nearly central single impression); the other his 12th class, *mollusca*, with the orders *pteropoda*, *gasteropoda*, *trachelipoda* (*helix*, &c.), *cephalopoda*, and *heteropoda* (*carinaria*); he placed the ascidians in his 4th class, *tunicata*, among his apathetic animals;

he made of the cirripeds his 10th class, with the orders *sessilia* and *pedunculata*, ranking them and the next two classes among sensitive animals.—Ehrenberg (1836), in his division of *ganglionœura* (with ganglionic nervous system), and subdivision *sphygmozoa* (with a heart and pulsating vessels), makes his 4th section of *mollusca*, characterized by absence of articulations to the body and by the irregular dispersion of the nervous ganglia; he gives the classes *cephalopoda*, *pteropoda*, *gasteropoda*, *acephala*, *brachiopoda*, *tunicata* (simple ascidians), and *aggregata* (compound ascidians); the cirripeds he places among crustaceans.—Owen (1843-'58), in his "Lectures on Comparative Anatomy," and article "Mollusca" in the "Encyclopædia Britannica" (8th edition), divides the province *mollusca* or *heterogangliata* into two sections, *acephala* and *encephala*, according to the absence or presence of a head and its accompanying parts. I. *Acephala*, with the classes: 1, *tunicata*; 2, *brachiopoda*; 3, *lamellibranchiata*, with the groups *monomyaria* and *dimyaria*, with one or two adductor muscles. II. *Encephala*, with the classes: 4, *pteropoda*; 5, *gasteropoda*, with the divisions *monocœcia* and *diocœcia*; and 6, *cephalopoda*, with orders *tetrabranchiata* and *dibranchiata*. The cirripeds he places among articulates, though in a class distinct from crustaceans, and he, with his predecessors, retains the *bryozoa* among radiates.—Siebold (1848) makes three classes as follows: 1, *acephala*, with orders *tunicata*, *brachiopoda*, and *lamellibranchia* (with suborders *monomya*, *dimya*, and *inclusa*); 2, *cephalophora*, with orders *pteropoda*, *heteropoda*, and *gasteropoda* (with suborders *apneusta*, *heterobranchia*, *tubicolæ*, *pectinibranchia*, and *pulmonata*); and 3, *cephalopoda*, without orders, but with families *nautilina*, *octopoda*, and *loligina*. (See Burnett's translation, Boston, 1854.)—Leuckart (1848) divides mollusca into four classes: 1, *tunicata*, with orders *ascidiæ* and *salpæ* (he is inclined to make these not simply a class, but a type intermediate between echinoderms and worms); 2, *acephala*, with orders *lamellibranchiata* and *brachiopoda*; 3, *gasteropoda*, with orders *heterobranchia*, *dermatobranchia*, *heteropoda*, *ctenobranchia*, *pulmonata*, and *cyclobranchia*; and 4, *cephalopoda*.—Before giving the classifications of Milne-Edwards and Agassiz, which seem to be the truest to nature, it will be instructive to glance at a few physio-philosophical and embryological systems as compared with the preceding founded upon anatomical structure. Oken (1809-'43) places the mollusca in his province of *dermatozoa* (sensitive or tegumentary animals) or *splanchnozoa* (visceral or fleshless animals), and in the circle of vascular, sexual animals, equivalent to *malacozoa* and *conchozoa* (glandular or shell animals); according to the anatomical system, the vascular animals are either venous (like mussels), arterial (like snails), or cardiac (like kraken or cuttle fishes); according to the de-

velopment of the feeling sense, the sexual animals (the same as the vascular) are either ovarial, orchitic, or renal. In his system (see his "Physiophilosophy," Ray society ed., 1847) the first class of mollusks (venous, ovarial animals or mussels) has the following orders: I. Protozooid mussels. II. Conchozooid mussels; this corresponds to the *acephala*, and is characterized by a membranous heart with two auricles. The second class (arterial, orchitic animals or snails) has the following orders: III. Protozooid snails or *androgyni* (bisexual). IV. Conchozooid snails or *diœcii* (with separate sexes); this class corresponds to gasteropods, having a membranous heart with one auricle. The third class (cardiac, nephritic animals or kraken) has the following orders: V. Protozooid kraken. VI. Conchozooid kraken. It will be seen from this system that the principles of Cuvier respecting the different plans of the four great divisions of the animal kingdom are entirely set at nought; orders, according to Oken, representing in their respective classes the characteristic features of the lower types.—Among the embryological systems may be mentioned those of Von Baer, Kölliker, Van Beneden, and Vogt. Von Baer (1827-'8) calls the mollusks the massive type, as the body and its parts are formed chiefly in round masses, the shape unsymmetrical, the nervous ganglia diffused and appearing late, and the movements slow and feeble; in the course of development identical parts are produced, curving around a conical or other space. According to Kölliker (1844), in the mollusks the embryo arises from a primitive part, grows uniformly in every direction, and either entirely encloses the embryonal vesicle, early in gasteropods and *acephala*, or late (forming a temporary vitelline sac) as in *limax*, or else contracts above the embryonal vesicle, forming a genuine vitelline sac, as in cephalopods. Van Beneden (1845-'55) places mollusks with worms and radiates under his group of *allocotyledones* or *allovitellians*, in which the vitellus or yolk enters the body neither from the ventral nor from the dorsal side; his class *mollusca*, at the first date, included cephalopods, gasteropods, pelecypods, and brachiopods; in his later work he added *acephala*, *tunicata*, and *bryozoa*, removing the last two from the polyps; the cephalopods, however, are not *allovitellians*, and any classification which unites in one group mollusks, worms, and radiates cannot be founded on correct principles. Vogt (1851) adopts the distinction of Kölliker, of animals in which the embryo is developed from the whole yolk, and those in which it arises from a definite part of it, in the former of which he places mollusks, with worms and radiates; he makes a primary division of the cephalopoda, in which the yolk is cephalic, with a class of the same, with the orders *tetrabranchiata* and *dibranchiata*. In the division *mollusca*, with an irregular disposition of the organs, he makes the follow-

ing classes: *cephalophora*, *acephala*, *tunicata*, *ctenophora*, and *bryozoa*. The last three classes constitute his *molluscoidea*. The separation of the cephalopods is unjustifiable, and the transfer of the *ctenophora* from *acephalan* radiates to mollusks cannot be maintained.—Milne-Edwards (1855) divides the third branch, *malacozoaria* or *mollusca*, into the two sub-branches: 1, mollusks proper, with the classes of cephalopods, pteropods, gasteropods, and *acephala*; and 2, molluscoids, with the classes *tunicata* and *bryozoa*.—Agassiz, in his "Essay on Classification" (1857), makes only three classes of the branch of mollusks: I. *Acephala*, with orders: 1, *bryozoa* (including the *vorticellæ*); 2, *brachiopoda*; 3, *tunicata*; and 4, *lamellibranchiata*. II. *Gasteropoda*, with orders: 1, *pteropoda*; 2, *heteropoda*; and 3, *gasteropoda* proper. III. *Cephalopoda*, with orders: 1, *tetrabranchiata*, and 2, *dibranchiata*. He includes *bryozoa* among mollusks, uniting with them the *vorticellida*, the plan of their structure not being radiated, but distinctly bilateral, and gradually leading through the brachiopods and tunicates to the ordinary *acephala*; *tunicata* show in the simple ascidians pedunculated young, resembling *boltenia*, and forming a connecting link with the compound ascidians; cephalopods are homologous with other mollusks in all their systems of organs, and can no more properly be separated from them on account of the partial segmentation of their yolk, than can the mammalia from other vertebrates on account of its total segmentation in their case. According to Prof. Owen, some of the compound ascidians have certain affinities to the zoöphytes; some of the marine *apneusta* (like *actæon* and *glaucus*) are related to some of the arbranchiate annelids; though cephalopods are the highest, they do not pass into *amphioxus* or any other embryonic form of vertebrate; he retains the *bryozoa* with the polyps. Prof. Huxley makes the primary divisions of molluscoids and mollusca; the former including the *polyzoa*, *tunicata*, and *brachiopoda*, the latter the *lamellibranchiata*, *gasteropoda*, *pteropoda*, and *cephalopoda*. Prof. Morse places the brachiopods among the worm-like articulate; and very likely the tunicates and *polyzoa* belong with them. (See BRACHIOPODA.)

MALACOPTERYGIANS, a division of fishes established by Artedi in the early part of the 18th century, including such as have the fin rays soft, except occasionally the first of the dorsal or pectorals. Cuvier divided them into three orders: 1, the abdominal, in which the ventrals are suspended to the under part of the abdomen, behind the pectorals, and not attached to the scapular arch, comprising the greater part of fresh-water fishes, as the carp, pike, cat fish, salmon, herring, and their allies; 2, the subbrachian, having the ventrals attached under the pectorals, the pelvis being suspended to the scapular arch, comprising fishes like the cod, flounder, turbot, &c.; 3,

the apodal, wanting ventrals and sometimes the pectorals, including the eel family. J. Muller limits the term to the group *scomberosocidae* of the suborder *pharyngognathi*, including the flying fish. This is rejected by Van der Hoeven, who returns to Cuvier's divisions, adding, however, a few families. (See FISHES, and ICHTHYOLOGY.)

MALAGA. I. A S. province of Spain, in Andalusia, bordering on Cadiz, Seville, Cordova, Granada, and the Mediterranean; area, 2,822 sq. m.; pop. in 1870, 505,010. The surface is irregular, being traversed from N. E. to S. W. by ranges of the Sierra Nevada, forming most picturesque and fertile plateaux and valleys, watered by innumerable streams. The chief rivers are the Jenil, constituting part of the N. boundary, the Guadiaro, and the Guadaljorce,

Guadalmedina, and Velez-Malaga. Lead, iron, tin, zinc, quicksilver, and manganese are found in large quantities. The climate is one of the hottest in Europe, but the great heat is tempered by refreshing breezes from the southwest. The vegetation is everywhere luxuriant; the principal products are grapes of various kinds, especially those named muscatel and Jaere, the sugar cane, pineapples, chirimoyas, and other delicious tropical fruits, aniseed, cumin, liquorice root, sumach, cork, and cochineal. The manufactures include silks, satins, cotton and hemp fabrics, morocco leather, wicker ware, hats, paper, soap, chemicals, and above all the far-famed Malaga wines. Agriculture and fishing are the chief industries in the interior and along the coast. The principal towns, besides the capital, are Velez-Malaga, Alora, Antequ-



Malaga.

ra, Colmenar, Ronda, Marbella, and Estepona. II. A city, capital of the province, on a gulf of the same name in the Mediterranean, 262 m. S. by W. of Madrid; pop. about 100,000, or with the suburbs, 130,000. It stands in the centre of a wide bay, surrounded by walls with nine gates, and flanked by high mountains, on the base of which it rises in amphitheatre; and seen from the sea it presents, with the ruins of its ancient fortifications and its Moorish castle, the Gibralfaro, on a lofty eminence to the east, an aspect of much grandeur. The streets, nearly all extremely narrow, and many of them not admitting vehicles, give the town a peculiarly Moorish appearance. The Guadalmedina, crossed by two good bridges, traverses the city from N. E. to S. W., dividing it into two quarters; but the river, which in winter becomes a formidable torrent inundating the streets, is dry in summer, when its bed serves as a thor-

oughfare. The houses (numbering about 7,000 in 1864) are large and high, and, being all white, look remarkably gay and clean. Most of them are built round a court. The Alameda, near the port, one of the most beautiful promenades in Spain, is surrounded by sumptuous edifices, and embellished with a number of fountains and statues, with rich marble seats at intervals through the grounds. In the Plaza del Riego is a monument to the memory of Torrijos and his 49 confederates executed by order of Moreno on Dec. 11, 1831; and the Paseo de Reding is an agreeable resort. Chief among the public buildings is the cathedral, begun in 1538, and completed in 1719; it is a stately structure in the composite style, with a spire 300 ft. high, and magnificent decorations; the high altar and choir are noteworthy for the perfection of their carved works representing the twelve apostles and many saints. The episco-

pal palace and the custom house are handsome edifices. Among the other notable buildings are four parish churches and two chapels, eleven convents, ten nunneries, two foundling, one military, and three general hospitals, a prison, four barracks, the post office, and a superb aqueduct. The places of amusement are the theatre and the *plaza de toros* or bull ring, with a number of concert and dancing rooms. Pipes for the supply of water from the river Torremolinos, 6 m. distant, were laid in 1874. The port is one of the finest and most commodious on the Mediterranean, serving as a refuge for vessels compelled to leave Gibraltar during the prevalence of the S. W. winds. A mole to the east upward of 1,200 ft. long, with a lighthouse upon its outer extremity, offers good protection; and the harbor, which has good anchorage for about 500 ships, is defended by four forts. Among other fortifications is the Gibralfaro, a Moorish castle on the site of a Roman fortress, on a hill commanding the city. The principal articles of export are wines and raisins, including muscatel, the finest in the world, *leja* or lye, and sun raisins. The crop of muscatel grapes yielded 2,700,000 boxes of raisins, the best of which go to England and Russia, and the lower grades to the United States. Sugar is extensively manufactured for export; the total production in 1872 was 21,960,000 lbs. The export trade in olive oil has greatly increased, mostly with France, Germany, England, and Russia; France and the United States take the most of the lead exported. The total value of the exports to the United States in the year ending Sept. 30, 1873, was \$2,814,682 79, raisins, lemons, and lead forming the principal part. The chief imports are linen, woollen, and silk fabrics, hardware, machinery, and cutlery. The port movements for the year ending June 30, 1873, were 1,028 steamers and 2,749 sailing vessels, with an aggregate of 542,802 tons. The chief manufactures are soap, cigars, hats, leather, white lead, and porcelain; and there are iron foundries, saw mills, lime and brick kilns, and silk-weaving establishments. The educational institutions are a seminary, a naval school, two endowed Latin, and a number of primary schools.—Malaga (anc. *Malaca*) was founded by the Phœnicians, and subsequently passed under the dominion of Carthage and of Rome. Its name is variously derived. Humboldt ascribes it to the Iberians; others connect it with *mela'n*, supposed to be the Phœnician name for salt fish, for the exportation of which the town was famous. In 714 it was seized without opposition by the Moors, who held it till 1487, when it was taken by Ferdinand the Catholic after a protracted siege. In 1810 Sebastiani, the French general, took the city, and exacted a contribution of 12,000,000 reals. It was again taken by the French in 1823.

MALAKHOFF, or **Malakoff**. See **CRIMEA**.

MALAN. I. César Henri Abraham, a Swiss theologian, born in Geneva, July 8, 1787, died

there, May 8, 1864. His ancestors, who were noble and Protestant, fled on account of persecution from Mérindol in southern France to Switzerland in the 17th century. At an early age he became a minister of the state church and a regent in the college of Geneva. Afterward, through the influence of Dr. Mason of New York and Robert Haldane of Scotland, from a Socinian he became a Trinitarian, and received much sympathy from English and Scotch Christians. He often visited England. He published "The Church of Rome" (translated into English, New York, 1844); "Stories for Children" (1852); and "Pictures from Switzerland" (1854). The American tract society and the publishing department of the Dutch Reformed church have printed many of his tracts. His most important work is his volume of hymns, entitled *Chants de Sion* (1826; enlarged ed., 1841), of which he composed both the words and the music. II. **Solomon César**, an English clergyman, son of the preceding, born in Geneva in 1812. After completing his education at Geneva he went to Oxford, where he graduated. He was appointed classical professor in Bishop's college, Calcutta, in 1838, but from impaired health returned in a few years to England, and afterward resided some time in Arabia. He became vicar of Broadwindsor, Dorsetshire, in 1845, and prebendary of Sarum in 1871. He is said to be able to use in conversation familiarly upward of 20 languages, and to translate upward of 100. Among other works, he has published "Three Months in the Holy Land" (1843); "A Plain Exposition of the Apostles' Creed" (1847); "A Catalogue of the Eggs of British Birds," and "A Systematic List of British Birds" (1848); "Magdala and Bethany," and "The Coast of Tyre and Sidon" (1857); "On Ritualism" (1867); "Life, Labors, &c., of César Malan" (1869); "Our Lord's Miracles and Parables" (1871); and numerous translations.

MALARIA (Ital. *mala aria*, bad air), or **Marsh Miasm** (Gr. *malvev*, to infect), an emanation which produces in mankind intermitting and remitting diseases. This poison is not cognizable by the senses, nor can it be detected by chemical tests; it is known only by its effects. The concurrence of vegetable matter susceptible of decay, of moisture either on the surface or a short distance below it, and of a certain elevation of temperature, is necessary for its evolution; of these, long continued heat has the greatest influence in increasing the intensity of the poison. Comparatively harmless in the northern part of the temperate zone, it becomes malignant and deadly in places equally favorable to its production, just in proportion to the increase in the mean annual temperature. Marshes, whether salt or fresh, and wet meadows are especially subject to malaria, particularly when drying under a hot sun. Grounds alternately flooded and drained are fertile sources of it, and it is this which renders the cultivation of rice so deleterious. Grounds

which, from the nature of the subsoil, retain the moisture a short distance beneath the surface, though that may be dry and parched, are favorable to the production of malaria. The process of clearing a new country of its woods, and thus exposing the soil to the full action of the sun, is commonly followed by the prevalence of fevers; and the same evils often follow the ploughing up of meadow lands. It is not necessary that the amount of the vegetable matter be great or its growth recent, since malarious diseases have often been caused by the drainage of ponds and lakes; and the fevers that prevailed at Bourg-en-Bresse ceased on filling in the half wet ditches of the fortifications. The low grounds on the margin of lakes and the alluvial lands bordering rivers in warm countries are always plagued with malaria. In India ground covered with low thick growths of brushwood or of weeds and grass, called jungles, are so well known to produce malarious fevers, that they are there termed jungle fevers; even open woods in tropical climates are productive of malaria. The steeping of hemp and flax, and the decay of vegetable refuse, potatoes, &c., in confined localities, as cellars or the hold of a vessel, have resulted in fever.—The quantity of water required for the generation of malaria is not large, a marsh completely covered with water being innocuous; it is only when the moisture is drying up under the influence of the sun that it becomes pestilential. So in tropical climates disease prevails chiefly at the commencement and after the termination of the rainy season, and is less prevalent while the earth is saturated. In some cases the quantity of vegetable matter concerned in the production of malaria must be exceedingly small. Dr. Ferguson, one of the medical officers in the army of the duke of Wellington, says: "In Spain, during the month of May, 1809, which was cold and wet, the army remained healthy; but in June, which was remarkably hot and dry, marching through a singularly dry, rocky country of considerable elevation, several of the regiments bivouacking in the hilly ravines which had lately been water-courses, a number of the men were seized with violent remittent fever (the first which had shown itself on the march) before they could move from the bivouac the next morning; and this portion of the troops exclusively were affected with this disorder for some time. In this instance, the half dried ravine having been the stony bed of a torrent, in which soil never could be, the very existence of vegetables, and consequently of their humid decay and putrefaction, was impossible, and the stagnant pools of water still left among the rocks by the watercourse were perfectly sweet. Yet this situation proved as pestiferous as the bed of a fen." ("On the Nature and History of Marsh Poison," Edinburgh, 1821.) Here, however, the total absence of vegetable matter would be difficult to prove, and would be in contradiction with all other experience.—Whatever may

be the nature of malaria, it is most concentrated near the surface of the earth, and becomes weaker as we rise above it; it is also most active at night, probably from the influence of the sun in rarefying and producing currents in the atmosphere, and perhaps, too, because it has a peculiar affinity for the fogs that are then apt to prevail. In malarious countries it is well known that exposure to the night air is apt to be followed by fever, and that those who sleep in the upper rooms of a house are safer than those who lodge on the ground floor. While as a general rule low and damp grounds are much more unhealthy than the hills in their neighborhood, yet in numerous instances this rule does not hold good, or is even reversed. The experience of the British army in the East and West Indies is conclusive on this point. In many cases this can readily be explained by the effect of winds and currents of air carrying the malaria to the higher ground, which had been generated on the lower; thus in Italy the malaria from the borders of Lake Agnano reaches the convent of the Camaldules, situated on a high hill three miles distant. Connected with the propagation of malaria by currents of air is the fact that woods sometimes act as a screen, protecting a place from the malaria which would otherwise be conveyed to it from some neighboring source; in Italy fevers have frequently become prevalent on the cutting down of trees which have thus served as a shelter. It becomes an interesting question how far malaria can be carried by winds. This has been very variously estimated; probably three or four miles is the maximum.—The effects of malaria are by no means confined to the production of fevers and diseases of an intermittent type, but it is only in warm climates and in certain unfavorable localities that its full effects upon the constitution are observed. In such places the growth is stunted, the complexion sallow, the limbs slender, the abdomen tumid, the hair lank and scant, and the teeth defective; life is commonly extinguished before 40 years of age, and the population is only kept up by immigration from healthier localities. Yet it is remarkable that when in such places persons live beyond their 40th year, they frequently recover some measure of health and attain to old age.

MALATESTA, a family of Italy, many of whose members were rulers of Rimini and other cities of the Romagna, and which became affiliated with the house of Montefeltro and with the dukes of Urbino. The founder of the family was Count Carpegna la Penna de' Billi, who lived in the 11th century, and who on account of his violent disposition was called *mala testa* ("bad head"), whence the surname of his descendants. Among the latter was Malatesta, count of Verracchio, who distinguished himself against the Ghibellines, became ruler of Rimini in 1295, and died in 1312. He was succeeded by his son Malatestino, a zealous enemy of the Ghibellines, who in 1314 added Ce-

sena to Rimini, and died in 1317. Threc of his brothers were deformed. Giovanni, one of the most repulsive of them, had for wife Francesca da Polenta, daughter of Guido the elder, lord of Ravenna. She became the mistress of her brother-in-law Paolo, though he was also married, and Giovanni killed his wife and brother with the same sword (1289). Dante, in his *Inferno*, gives a thrilling narrative of this tragic end of Francesca and Paolo da Rimini, and the story is a favorite theme of poets and artists. Malatestino was succeeded by his brother Pandolfo I., instead of by his son Ferrantino, the former being confirmed by the pope on account of his vigorous opposition to the Ghibellines. He was munificent, but disgraced his reign by the murder of his nephew, the count of Ghiassolo. On the death of Pandolfo in 1326, his nephew Ferrantino was installed as ruler. He served against the infidels in Palestine, but after a conflict with one of his relatives he was expelled from Rimini by the pope in 1335, and died in 1353. Two sons of Pandolfo, Malatesta II. (died in 1364) and Galeotto (died in 1385), became joint rulers after the expulsion of Ferrantino. They made peace with the pope, and added to their dominion Fano, Fossombrone, Pesaro, and some other possessions. Galeotto was succeeded by his sons Carlo (died in 1429) and Pandolfo III. (died in 1427). The former was lord of Rimini and a part of Romagna, sided with Pope Gregory XII. during the schism, and represented him at the council of Constance, after having commanded the Venetians against the emperor Sigismund. Subsequently, while aiding the Florentines to expel the Milanese, he was for some time imprisoned at Milan (1427). He was the best soldier and the most renowned ruler of the whole family. Pandolfo III., after having conquered Brescia and Bergamo, was driven in 1421 from the latter city by the duke of Milan. The most remarkable among their descendants was Sigismondo Pandolfo (died in 1468), who successively commanded the Florentine, Neapolitan, Aragonese, Venetian, and Sienese armies, and conquered for Venice a portion of the Morea. He was excommunicated by the pope in 1462 for having made war upon the Roman see. He was a munificent patron of letters and art, and had palaces built and libraries established in Rimini. His first wife was a daughter of the marquis of Este, and his second of Francesco Sforza. The last ruler of Rimini was Pandolfo IV., who in 1503 was robbed of his patrimony by Cesare Borgia. After Borgia's death he returned to Rimini, but was expelled in 1526 by Pope Clement VII., and died in want at Ferrara.

MALAY ARCHIPELAGO. See INDIAN ARCHIPELAGO.

MALAYO-POLYNESIAN RACES AND LANGUAGES. The Malayo-Polynesians are the light-complexioned, olive-colored, and straight-haired inhabitants of the islands of the Indian and Pacific oceans, from the Andamans in the bay of Ben-

gal in the west to Easter island on the east, and from Formosa and the Hawaiian islands in the north to New Zealand in the south. They occupy also the Malay peninsula on the Asiatic continent, and partly also the island of Madagascar adjacent to the African coast. Ethnologically and linguistically they form two great divisions, Malaysians proper and Polynesians. The former chiefly occupy the western islands, and the latter the groups E. of the Philippines and Booro, subdivided into Micronesia, Melanesia, and Polynesia (in the narrower sense). The original inhabitants of all these islands were the Papuans, a dark race, with woolly hair growing in tufts. (See PAPUAN RACES AND LANGUAGES.) The Malayo-Polynesians came from the S. E. of Asia, occupied at first only the islands adjacent to it, and gradually extended their territory to the east, either extirpating the previous inhabitants, or driving them into the interior of the islands and taking possession of the coasts. Their relation to the Papuan population of these islands therefore is similar to that of the Aryans to the Dravidas of India. Some contend that Polynesia was the earliest home of these races, and that they came originally from the American continent, but the hypothesis seems untenable. Though the Malayo-Polynesian type and culture are purest and quite primitive in the eastern groups of islands, yet the character of their fauna and flora is exclusively Asiatic, and the numerous historical traditions current among the people record migrations only from the west. These traditions, together with the fact that many of the names of the islands of Polynesia proper are variations of those belonging to the Tonga and Samoa groups, point to the latter as the common source of the population of the former. On Tonga and Samoa there are traditions that the paradise and cradle of the Polynesians is the island called Bulotu or Purotu, which is probably Booro, E. of Celebes. From the great similarities existing among the languages and customs of the various Polynesian races, it is inferred that the migrations from Tonga and Samoa do not date back to very remote periods. The circumstance that the traditions leap from Booro at once to Tonga, leaving the whole of Melanesia entirely untouched, renders it probable that the Polynesians on their departure from Booro made no large settlements on any of the islands between Papua and the Samoan archipelago, and that the few who chose to establish themselves on them accordingly became largely intermixed with Papuan elements. Of a similar impure type are the Micronesian Polynesians. The separation of the Polynesians from the Malaysians and their emigration from Booro may be fixed at about 1000 B. C., as the literature of the latter was developed before our era, and shows even then a strong mixture of Old Indic or Sanskrit elements, which cannot be found in the speech of the former. The Polynesian languages, there-

fore, are considered to represent the primitive forms of speech.—To the western or Malayan division of the Malayo-Polynesian races belong the Tagalas or Bisayas (inhabitants of the Philippines), the Malays of Malacca, the Acheenese of Sumatra, the Sundanese, the Javanese, the inhabitants of Bali and Madura, the Bataks of the interior of Sumatra, the population of Nias and Batoo islands, the Hovas of Madagascar, the Dyaks of Borneo, the Mankasars (Macassars) and the Bughis of Celebes, and the Alfooras of the Moluccas and the adjacent islands. To the eastern or Polynesian division belong the Polynesians proper, the Melanesians, and Micronesians. The Polynesian race embraces the inhabitants of the Samoa group or Navigator's islands, the population of the Tonga group or Friendly islands, the Maoris of New Zealand, the Tahitians, the inhabitants of the Rarotonga group or Cook's islands, the people of the Tubuai group or Austral islands, of the Low archipelago or Touamotou islands, of the Marquesas islands, of the Hawaiian or Sandwich islands, and of numerous isolated islands in the Pacific ocean. The most eastern island inhabited by Polynesians is Vaihū or Easter island, and the most western Tikopia or Tukopia. To Micronesia belong the islands E. of the Philippines to lon. 180°, and from the Marianas or Ladrões in the north to the equator in the south. The population of the Marianas or Ladrões is in part extinct, and many groups of the Carolines are also uninhabited. The people of the Gilbert archipelago form the transition from the Micronesians to the Polynesians. The Melanesians embrace the inhabitants of the Feejee islands, of New Caledonia, of the New Hebrides, and of several of the islands extending thence to Papua, whose ethnological character has not yet been definitely established. The physical constitution of the Malayo-Polynesians (excepting the Melanesians, who present a strong Papuan type) presents three fundamental forms, generally designated as the Malayan, Batak, and Polynesian. The pure Malayan type is commonly found among the Malays proper, Rejangs, Acheenese, Javanese, Madurese, and Tagalas. They are generally 4½ or 5 ft. high; the skull is equally long and broad; the back of the head is short and square; the cheek bones protrude; the jaw bone is broad and prominent; the nose flat; the nostrils broad and large; the eyelids not as large as those of the Mediterranean races, nor as narrow as those of the Mongolians; the eyes are black, but not brilliant; the mouth is large, with thick lips, but not puffed up; the skin is copper-brown with a tint of yellow; there is scarcely any beard, and the hair is straight, coarse, and black with a touch of brown; the loins and calves are thin and weak. The women are shorter than the men; their breasts are small, pointed, and firm, and their bosoms little developed and often quite flat. The Batak type is represented by the Bataks, the inhabitants of Nias, Batoo, and Bali, the

Bughis, and the Mankasars and Alfooras. The body is taller, larger, and more muscular, the skull and face more oval, and the back of the head rounder; the cheek bones are less prominent and the jaw not quite so broad; the nose is rather pointed and straight, and depressed at the root; the mouth is smaller and better proportioned; the skin is light brown, and the cheeks show a tinge of red; the hair is straight but thinner, and with a clearer shade of brown; the breasts of the women are larger and hemispherical, and the bosom is fuller and higher. The Polynesians are of a still higher stature, and their bodies are generally well proportioned and athletic; the women, however, are rather short and stout, with breasts like those of the Malays; the skin is several shades darker, especially in the furthest north and south, while the population of the equatorial islands is the lightest of all; the eyes are small, black, and not very vivid; the hair is straight, coarse, black with a tinge of blue, and a little inclined to curl, the use of coral chalk giving it sometimes a reddish or flaxen color; the growth of beard is little developed. The principal trait of the character of the Malayo-Polynesians is undoubtedly taciturnity and reserve, which is softened only in case of admixture with Papuan blood; they dislike to be approached very closely, and they lay great stress on keeping within the bounds of deportment which custom prescribes for the various classes of society; there is therefore an abundance of ceremonial laws among the peoples of the west, and of *tabu* laws among those of the east. They are possessed also of an almost incredible degree of savagery and bloodthirstiness. They are the cannibals *par excellence*, not through want of food but through the peculiar hardness of their character. Cannibalism is practised not only among the inhabitants of the South sea islands, but even among several of the half civilized races of the west, such as the Bataks of Sumatra, who have produced a written literature, and who have cannibal rites in certain cases even prescribed by law. They are generally good and fearless seamen, and readily undertake long journeys in boats apparently very unsafe. They possess good powers of observation, and are inclined to adopt the ideas of foreigners, and also to imitate their customs. The sentiments of family ties and obligations are but little developed. Infanticide is of frequent occurrence; old, feeble, and sick persons are badly treated and sometimes killed; prostitution is prevalent, and parents exercise but little authority. Love of gain, however, is the strongest passion among them, and lying, stealing, murder, and all manner of crimes are unscrupulously employed whenever they offer a chance of profit. The hope of plunder is their principal cause of war, and piracy is in the Indian archipelago considered to be an honorable and chivalric occupation. They are brave, but do not hesitate to poison their weapons and to play cow-

ardly tricks on their enemies. They are easily excited to religious emotions, and their rich store of legends testifies to the vivacity of their imagination. The Javanese are the most cultured among them, and evince capacity for a high degree of intellectual development. (For the peculiar customs of the various races, see the articles descriptive of their habitats.)—

LANGUAGES. The Malayo-Polynesian languages form an independent group, unconnected with any other. They are derivatives of an extinct primitive form of speech, which suffered three or four dialectal variations before it had attained its complete development. They do not possess the same grammatical structure throughout, but only agree more or less in the system of sounds, the general form of the verbal roots, and the main principles of grammar. In degree of development the Polynesian languages stand lowest; the Micronesian and Melanesian are a step higher; and the Malayan, and especially the Tagala languages, occupy the highest rank. The known languages of the eastern or Polynesian division are the idiom of the Marianas or Ladrões, which forms the connecting link with the Malayan languages; the languages of the Feejee, Annatom, Erromango, Tanna, Malikolo, Mare, Lifoo, Baladea (New Caledonia), Bauro, and Guadalcanar islands, which are all more or less closely related; and the Maori, the language of New Zealand, with its kindred languages of the Tonga, Rarotonga, Tahiti, Hawaiian, and Marquesas islands. Of the western or Malayan division, there are known in the Philippines the Tagala of the south of Luzon, the Pampanga of the southwest, the Ilocana and Bicol of the southeast, the Ybanag of the province of Cagayan, the Bisaya spoken on several islands south of Luzon, and the Zebuana on Cebu and the adjacent islands. Closely related to them are the languages of Formosa, of which the Favorlang and Sideia dialects are best known. Three dialects are known of the Malagasy, or language of Madagascar, viz.: the Ankova dialect, spoken by the Hovas in the interior of the island, the Betsimisaraka dialect of the east, and the Sakalava dialect of the west. The Malay language proper, which is in extent and in regard to its literature the first among the whole group, is spoken on the Malay peninsula and the adjacent islands, and on the coasts of Sumatra. Two dialects may be distinguished in it, the Malacca and the Menangkabow or Padang. Besides these dialects, a literary or choice language is employed by the Malays. Several authors divide the various modes of speech according to castes: *bahāsa dālam*, the language of the court; *bahāsa banṣācan*, that of the educated classes; *bahāsa dāgah*, that of merchants and traders; and the *bahāsa kaṭākan*, that of the common people. The Malay language possesses a large and varied literature, the beginnings of which date back to the 13th century A. D., and which is especially rich in poetical works, legendary narratives, Mohammedan the-

ology, jurisprudence, chronicles, travels, and various paraphrases of Indic epics. Besides the Malay proper, there are several minor languages spoken on Sumatra, as the Batak in the interior of the northern portion of the island, and the languages of the Rejang and the Lampung in the south. Javanese is spoken on Java and several adjacent islands, and stands in importance next to Malay, but its literature reaches back to the 1st century of our era. (See JAVA, LANGUAGE AND LITERATURE OF.) Closely related to Javanese is the Sunda language, spoken on the western portion of Java. Of the languages in Borneo, that of the Dyaks is well known; according to the missionary Hardeband, it has four dialects. The Dyaks have not produced a written literature, but they possess a number of ancient songs composed in a peculiar and only partly intelligible language, which they call *basa sañan* or the language of the good beings, *i. e.*, the spirits of their ancestors. The Bughis and Mankasar (Macassar) languages, spoken in Celebes, have also been investigated.—The statement above made that these languages form an isolated family of speech is in accordance with the latest researches of Friedrich Müller, on whose elaborate treatise on the Malayo-Polynesian languages in the *Reise der österreichischen Fregatte Novara: Linguistischer Theil* (Vienna, 1867), and excellent ethnological account of the races in his *Allgemeine Ethnographie* (Vienna, 1873), this article is based. Bopp, in the *Abhandlungen der Berliner Akademie* (1840), is not of the same opinion. He holds the Malayo-Polynesian languages to be a branch of the Aryan or Indo-European family, and direct descendants of the Indic group. He drew his conclusion from the fact that the Malay and Javanese languages contain a large amount of Sanskrit elements, which however do not belong to the original stock, and were gradually incorporated, as both history and the absence of Indic forms in the Polynesian languages amply testify. Max Müller has taken still another view of the relation which these languages hold to other families of speech. In Bunsen's "Christianity and Mankind" he attempts to establish that the Malayo-Polynesian languages form a member of the great so-called Turanian family, and that they are especially closely related to the Tai languages. He says: "A language which shares so many grammatical principles in common with Khamti and Siamese, and differs from Sanskrit on every essential point of grammar, can no longer be counted as a degraded member of the Aryan family, however great the authority of him who first endeavored to link Sanskrit and Malay together." Friedrich Müller has a satisfactory argument in the above cited work to show that the seeming similarities of several grammatical forms in the Tai and Malayo-Polynesian languages do not warrant us in considering the latter a derivative group of the former. Numbers constitute one of the highest linguistic tests of

relationship, and the following table of the first ten cardinal numbers in the most important of the Malayo-Polynesian languages | shows at once the close connection existing among them, and their isolation from other families:

THE FIRST TEN CARDINAL NUMBERS IN THE MALAYO-POLYNESIAN LANGUAGES.

	Malay.	Javanese.	Sundanese.	Malikānārī.	Dyak.	Tagala.	Bisaya.	Ilocana.
ONE.....	sātu or sa	sa	sa or sigi	si	ija, ja	isá	usa	meysa
TWO.....	dūva	ró	dua or duva	ruva	duā	daluá	duha	dua
THREE.....	tiga	tigā	tilu	tallu	telo	tatlo	toló	tal
FOUR.....	ámpat	papat	opat	appá	ápat	apat	upát	eppa
FIVE.....	lima	limā	lima	lima	limā	limá	lima	lima
SIX.....	ánam	něném	gěnap	annañ	ğahaven	anim	unum	niném
SEVEN.....	táđoh	pitu	tuđuh	tuđu	uđu	uđu	pitó	pitó
EIGHT.....	delápan	vólu	dalapan	sagantađu	hapa	naló	naló	oaló
NINE.....	sembilan	sāññ	salapañ	salapan	ğalatien	siyám sigua	siám	siám
TEN.....	sapuluh	sapuluh	sapuluh	sampulo	sapulu	poló	napulo	sañapulo

	Marianese.	Malagasy.	Samoa.	Tonga.	Maori.	Rarotonga.	Tahitian.	Hawaiian.	Feejee.
ONE.....	yakha	isa or iray	tasi	taha	tahi	tai	tahi	tahi	dua
TWO.....	yugua	roa	lua	ua	rua	rua	rua	lua	rua
THREE.....	tulo	telo	tolu	tolu	toru	toru	toru	kolu	tolu
FOUR.....	fafat	éfatrá	fa	fa	va	a	ha	ha	va
FIVE.....	lima	dimy	lima	nlma	rima	rima	rima	lima	lima
SIX.....	gunun	enlná	ono	ono	ono	ono	ono	ono	ono
SEVEN.....	fiti	fito	fitu	fitu	vitu	itu	litu	hiku	vitu
EIGHT.....	gualo	valo	valu	valu	valu	varu	varu	varu	valu
NINE.....	siám	siy	iva	hiva	iva	iva	iva	iva	clva
TEN.....	manot	folo	sefulu	honofulu	nahura	nauru	ahuru	umi	tlui

We shall state only the principal features of the two groups. The Polynesian languages possess the consonantal sounds *k, ŋ, h, 't, n, s, l, r, p, m, f, w, v*, and the vowels *a, e, i, o, u*, both short and long. In several of the languages some of these consonants are absent, and diphthongs are entirely unknown. Syllables may begin with a consonant, but must end with a vowel; accumulations of consonantal sounds are carefully avoided. The accent rests generally on the penult, and seldom on the antepenult or the ultimate. Roots, like those of the Aryan and Turanian families, are not found; there are only a sort of verbal stems, which in their external verbal movement resemble those of the Semitic languages, but consist throughout of two syllables. The various derivatives are formed from these either by means of reduplication, or by prefixes or suffixes. Distinctions of number like those in the inflected languages are wanting. Nouns designate thoughts or objects in a peculiar vague manner, implying rather plurality than singleness, and require the introduction of certain elements into the sentence to render more definite their use in the singular number. Some of these elements represent the numeral one, and others have the force of demonstration. When it is desired to render the plural number more distinct and definite, the noun is coupled either with a numerical expression or with some indefinite pronominal stem. A number of particles are used to designate nominative, genitive, dative, accusative, instrumental, locative, social, abessive, and ablative cases. As nouns

do not possess grammatical gender and do not admit of inflection, adjectives also remain entirely unchanged, and are used attributively by placing them behind, and predicatively by placing them before their nouns. The dual and plural of pronouns are indicated by composition with the numbers two and three, and possess an exclusive and inclusive form, according as the person addressed is excluded or included. The Polynesian verb is extremely indefinite. Externally indistinguishable from the noun, it is recognized as a verb only by its position in the sentence and its connection with the pronoun. The essentials of time and voice remain vague; even whether an action or a state of being is designated must be inferred from the introduction of certain affirmative particles.—The Malayan languages employ the consonants *k, g, ŋ, h, 't, f, ġ, p, y, t, d, n, s, l, r, p, b, m, f, v*, and the vowel sounds *a, d, á, ã, u, é, e, o, á, i, ú, é, ô* (see WRITING); genuine diphthongs are unknown. This system of sounds does not include the foreign elements found in Malay and Javanese. The Tagala languages have no palatals; Javanese makes use also of cerebrals, and Bughis of nasals. Malayan syllables always open with a single consonant, and the penult is always accented, causing a lengthening of the vowel. Instead of roots, the Malayan languages possess only stems or variations of roots, which were originally dissyllabic, though probably after having passed through trisyllabic forms developed from monosyllables. Words of a single syllable now used are unmistakably contractions of dissyllables. Re-

duplication, prefixing, suffixing, and infixing are the processes of word-building. While the Polynesian languages employ certain forms of words as nouns and verbs without any special vocal changes and additions, the Malayan languages attempt to distinguish the parts of speech independently of their position in a sentence. A noun not specially qualified designates the sum of all the persons or objects of which it is the name, or has always the force of an indefinite plural. The numeral one, or a demonstrative or possessive pronoun, added to it, reduces a noun to the singular number. The definite plural is formed either by reduplication, as in Malay *rāḍa*, king, *raḍa-rāḍa*, kings, or by the addition of plural expressions, many, multitudes, &c. The cases are indicated by prefixing prepositions. Adjectives remain invariable; comparison also is made by external aids. Besides the usual pronominal forms, it is customary, especially in Malay and Javanese, to employ servile and ceremonious expressions for the first and second persons. The force of a verb is indicated by prefixes, its relation to the object by suffixes; and though the Malayan verb differs somewhat from a noun, yet it may take the place of the latter by being merely placed in conjunction with particles used to modify nouns. In Malay the present tense is determined by *lāgi*, still; the preterite by *sudah* or *telah*, done, passed; and the future by *hendak* or *mahu*, to will, *nanti*, to expect, or *akan*, to, in order to.—See, besides the works of Friedrich Müller above cited, Ellis, "Polynesian Researches" (London, 1829); Yvan, "Six Months under the Malays" (London, 1855); Turner, "Nineteen Years in Polynesia" (London, 1860); Waitz, *Anthropologie der Natureölker*, continued by Gerland (Leipzig, 1860-'69); Cameron, "Our Tropical Possessions in Malayan India" (London, 1865); West, "Ten Years in South Central Polynesia" (London, 1865); Wallace, "The Malay Archipelago" (London, 1869); Semper, *Die Philipinen und ihre Bewohner* (Würzburg, 1869); and Perty, *Anthropologie* (Leipzig, 1873-'4).

MALAY PENINSULA, the name given by geographers to the long and narrow tract which projects southward from Indo-China, and forms the southern extremity of the Asiatic continent, bounded E. by the China sea and the gulf of Siam, and W. by the bay of Bengal and the straits of Malacca. It is sometimes called by the Malays *Tana Malayu*, "Malay Land," and is supposed to be the Golden Chersonesus of the ancients. It extends from the parallel of the head of the gulf of Siam, in lat. 13° 30' N., to Cape Burus on the southwest, about 30 m. from Singapore, in lat. 1° 15' N., and to Cape Romania on the southeast, in lat. 1° 17' N.; length about 900 m., greatest breadth about 180 m.; estimated area, exclusive of Tenasserim, about 80,000 sq. m.; pop. conjectured to be about 500,000. The upper and narrower part of the peninsula has a population composed chiefly of Siamese, or a

mixed race of Siamese and Malays called Sam-sam. The western half, N. of lat. 10°, forms a part of the district of Tenasserim in British Burmah. The lower part, or the peninsula in the restricted sense, is the country of the Malays, and has an area of about 60,000 sq. m. Along the shores of the peninsula are many islands, of which the principal are Salang, Trutao, Lancava or Langkavi, and Penang on the W. side, Singapore, Batan, and Bingtang at the southern extremity, and Tantalem on the E. coast. The most important political division of the peninsula is the British Straits Settlements (Penang, Malacca, and Singapore), which, though small in area, have about half the population of the country. With the exception of the portion included in Tenasserim, the N. part of the peninsula, as far S. as the bay of Chya on the E. coast, in about lat. 9° N., is subject to the king of Siam. The Malay states are Quedah, Perak, and Selangore on the W. side; Patani, Kalantan, Tringanu, and Pahang on the E. side; Rumbowe, Jehole, and Jompul in the interior; and the principality of Johore, which comprises the southern extremity of the peninsula. A few of these are dependent on Siam, several only nominally; but most of them are independent and under the protection of the British. A range of granite mountains runs through the whole length of the peninsula, on both sides of which spread alluvial plains, not much elevated above the sea. The maximum altitude of the range is attained E. of Quedah, between lat. 6° and 7° N., where it is about 6,000 ft. Further N. the loftiest peaks are only about half this height. The most extensive of these plains are on the W. side of the mountains. The rivers are numerous but small, and few of them navigable except so far as the tide ascends them; the largest are the Perak on the west and the Pahang on the east. The only lake of any considerable extent lies between Malacca and Pahang.—The zoölogy of the peninsula is varied and extensive. There are ten species of monkeys, and an ant-eater. There are several species of bats, of which the most remarkable is the *kalung* or vampire, which is larger than a crow; it flies high in great flocks, and is very destructive to fruit. The only plantigrade animal is a small bear (*ursus Malayensis*). There are eight species of the feline family, of which the largest are the tiger and the leopard, both very numerous and destructive to human life. The domestic cat has a tail about half as long as that of the European cat. The domestic dog exists as a vagrant without a master, and there are said to be wild dogs in the forests. The Indian elephant and two species of rhinoceros are met with. The Malay tapir and the wild hog are abundant. The ox and the domesticated buffalo are used for riding and for draught. The domestic ox is small and short-legged, but strong and hardy; and there are two species of wild ox, one of which, called by the Malays *saladang*, seems to

be peculiar to the peninsula. There is a species of wild goat, and a small species of domestic goat. Three species of deer are met with in the peninsula, one of which is the small muntjac. The sheep and the rabbit are not indigenous, but have been introduced by Europeans. Swine and fowls are very abundant. The most remarkable birds are the *marak* or wild peacock, the double-spurred peacock, a small and beautiful species, several species of pheasants, a partridge, snipe, sun birds, woodpeckers, the wild cock, and the domestic cock, the last a small but very courageous bird. The species of pigeons are very numerous, and some are no larger than a thrush; the prevailing color is green. The parrot family is numerous, but is not remarkable for brilliancy of plumage. The swallow whose nest is eaten by the Chinese is found in the caves of the islands. The birds of prey consist of a variety of kites and hawks. Among the reptiles are the alligator, the iguana, several species of small lizards, and about 40 species of snakes, of which three or four, among them the cobra, are venomous. Fish are very plentiful, and form the principal animal food of the mass of the people. The white pomfret, called *bawal* by the Malays, is said to be one of the most delicate fishes in the world to the European palate. The only cetaceous animal is the dugong. The neighboring seas afford a large and beautiful variety of shells. —The forests yield ebony, sapan, and eagle wood, and several species valuable for timber. Rattans, bamboos, and palms furnish most of the materials used by the Malays in constructing their houses. Rice, cocoanuts, yams, the sugar cane, and esculent fruits are the chief products of agriculture. The grain used on the peninsula is mostly imported from Sumatra and Bengal. Among the fruits, those most esteemed are the durian and the mangosteen. The durian is an oval spine-covered fruit, of a green color and about as large as a cocoanut, while the mangosteen is reddish brown in color and spherical in shape. Pineapples are plentifully produced in great perfection. Caoutchouc and other valuable gums and resins, drugs, spices, ivory, and horns are exported, and coffee, cotton, and tobacco are raised. The most remarkable and valuable product of the peninsula, however, is the gutta percha tree, which was here first made known to Europeans. The tin mines in many parts of the country are extensive; but they are imperfectly worked, and of late years, owing to the exhaustion of surface ores, the product has declined. Some gold is produced. The climate of the peninsula is hot and moist. The mean annual temperature at the level of the sea is nearly 80°, the mean range being from 70° to 90°. There is no rainy season, but rain falls at short intervals throughout the year, and there are heavy dews and frequent fogs. Generally the climate is not unhealthy, though there are some spots infected with a most pestiferous malaria. —The native population of the peninsula, with

the exception of the northern portion and the black woolly-haired people known as the Semangs, who inhabit the interior, are of the Malay race, and speak the Malay language. Most of the Malays are settled and civilized, but others lead a nomad life on the land, the rivers, or the sea. The land nomads practise a rude agriculture; the river nomads live entirely in boats, and subsist on fish and wild roots. Their boats are about 20 ft. in length; at one end is the fireplace, in the middle are their utensils, and at the stern is the sleeping place, where beneath a mat a family of five or six, together with a cat and dog, frequently find shelter. In these boats they skirt the shores of the rivers, collecting their food from the forests, and when one spot is exhausted proceed to another. These people are pagans, and are very ignorant and filthy in their mode of life. The sea rovers roam over the whole archipelago in their prahus or boats, and are generally pirates. The civilized and settled Malays are Mohammedans, and their governments are despotic. The peninsula is supposed by some writers to have been the original seat of the Malay race. The civilized Malays all claim to be descended from emigrants from Sumatra, who in the 12th century (about 1160) entered the peninsula at its S. E. extremity, where they founded Singapore, and gradually drove back the indigenous inhabitants into the mountains. At the close of the 18th century the Malays, who had been pagans up to that time, adopted Mohammedanism, and from the year 1276 Mohammedan monarchs reigned at Malacca. In the 15th century a large part of the peninsula became subject to Siam. In 1511 Mohammed Shah, the Malayan sultan, was overthrown by the Portuguese under Albuquerque. At present the peninsula is much less populous than formerly, owing to foreign and intestine wars and the incursions of pirates. (For British possessions on the peninsula, see MALACCA, PENANG, SINGAPORE, and STRAITS SETTLEMENTS.)

MALBONE, Edward G., an American portrait painter, born in Newport, R. I., in August, 1777, died in Savannah, Ga., May 7, 1807. When very young he painted a landscape scene for the Newport theatre, afterward employed himself in drawing heads in miniature, and at 17 years of age settled in Providence as a portrait painter. He removed in the spring of 1796 to Boston, where he was well received, and during the next four years pursued his art with industry in various cities. In 1800 he accompanied Washington Allston to Charleston, and in 1801 sailed for Europe. Malbone remained a few months in London, where he was urged by Benjamin West, the president of the royal academy, to take up his permanent residence; but he returned to Charleston in December. For several years he painted miniatures in the chief cities of the United States; and in 1806 he visited the West Indies, hoping to regain his health, but in vain. His best picture is

"The Hours," in which three female figures represent the Present, Past, and Future.

MALCOLM, Sir John, a British diplomatist, born in Eskdale, Dumfriesshire, May 2, 1769, died in London, May 31, 1833. He was sent to India at the age of 13, in the charge of his uncle, Dr. Paisley, and received a cadetship under the East India company. In 1797 he was made captain, distinguished himself in a series of important services by bravery and intelligence, and after the fall of Seringapatam was secretary to the commission appointed to divide Mysore. In 1799 he was commissioned by Lord Wellesley to negotiate with Persia a defensive alliance against an anticipated French invasion of India. He had at this time acquired several eastern languages, and had been in 1792 staff interpreter of Persian. In 1801 he was appointed private secretary to the governor general, but was again sent to Persia in the following year. In February, 1803, he became commissioner of Mysore, and joined the army of Gen. Arthur Wellesley in the Mahratta campaign. In 1805 he was recalled to Bengal, where he was actively occupied in forming treaties of alliance with native princes. In 1808 he went again to Persia, but did not obtain the advantages hoped for by the British government. On returning thither the next year as plenipotentiary, owing to a change in the ministry, he was received in the most flattering manner, and on his departure in 1810 was honored with the order of the sun and moon and made a khan and sepahdar of the empire. In 1812 he went to England, was knighted, and published a "History of Persia" (2 vols. 4to, 1815), the materials for which he had drawn from original Persian annals as well as extensive personal research and observation. On returning to India in 1817, he was appointed political agent in the Deccan, with the rank of brigadier general in the army. He served under Sir T. Hislop as second in command during the Mahratta and Pindaree wars, and especially distinguished himself at the battle of Mehidpoor, in which Holkar was routed. After this war he was appointed governor of Malwa and the adjoining provinces, with the rank of major general. The country was then in a state of anarchy, brigandage and rapine being generally prevalent; he succeeded in restoring order, and governed mildly but firmly. An account of this part of India was published by him in 1823, under the title of "A Memoir of Central India." He was in England from 1821 to 1827, when he was appointed governor of Bombay, which office he held for three years, and then returned to England. He was elected not long afterward to parliament for Lannceston, and distinguished himself by active opposition to the reform bill. A monument was erected to his memory in Westminster abbey, and also an obelisk 100 ft. high near Lantholm, in Eskdale. He also published a "Sketch of the Political History of India from 1784 to 1823" (London, 1826), and a "Life of

Lord Clive" (1836).—See "Life and Correspondence of Sir John Malcolm," by John W. Kaye (2 vols., London, 1856).

MALCOM, Howard, an American clergyman, born in Philadelphia, Jan. 19, 1799. He entered Dickinson college in 1813, was licensed to preach in May, 1818, by a Baptist church in Philadelphia, and entered Princeton theological seminary, where he remained two years. On finishing his studies he was settled over a church in Hudson, N. Y., and afterward in Boston and Philadelphia. He was president of the college at Georgetown, Ky., from 1839 to 1849, and of the university at Lewisburg, Pa., from 1851 to 1859, having been obliged by the failure of his voice to relinquish preaching. In both institutions he filled also the chair of metaphysics and moral philosophy. The disease in the throat increasing, he retired to private life in Philadelphia. In 1841 he received the degree of D. D. simultaneously from the university of Vermont and Union college, N. Y., and after his resignation at Lewisburg was made LL. D. by that institution. He visited most of the countries of Europe, and travelled as a deputy from the Baptist missionary society in Hindostan, Burmah, Siam, China, and Africa. He was one of the founders of the American tract society, of which he was a vice president from the beginning. He was also one of the prominent laborers in establishing the American Sunday school union, having visited on its behalf, when first organized, every principal city in the United States. Among his works are: a "Dictionary of the Bible" (18mo, Boston, 1828; enlarged ed., 1853); "The Extent of the Atonement;" "The Christian Rule of Marriage" (1830); "Memoir of Mrs. Malcom" (1833); "Travels in Southeastern Asia" (2 vols. 12mo, Boston, 1839); and "Index to Religious Literature" (2d ed., Philadelphia, 1870). He has also published several addresses and other tracts, and edited the "Imitation of Christ," Law's "Serious Call," Keach's "Travels of True Godliness," Henry's "Communicant's Companion," and Butler's "Analogy of Religion."

MALCZEWSKI, Antoni, a Polish poet, born in Volhynia about 1792, died in Warsaw, May 2, 1826. He served in the army from 1811 to 1816, and afterward travelled in Italy, Switzerland, and France. Having gone to Volhynia, he eloped to Warsaw with the young wife of one of his neighbors, whom he had cured of a dangerous illness by magnetism. Want and misery, however, soon embittered the life of the lovers, and hastened the death of the poet. His principal work, *Marja* (Warsaw, 1825), a metrical romance in the style and spirit of Byron, which appeared in the last year of his life, was severely criticised, but is now generally recognized as one of the gems not only of Polish but of modern poetry. It has passed through numerous editions, and has been translated into French by Clémence Robert, and into German by K. R. Vogel.

MALDEN, a town of Middlesex co., Massachusetts, on a stream of the same name, navigable by vessels of 300 tons to within half a mile of the main village, and on the Boston and Maine railroad and the Saugus branch of the Eastern railroad, 5 m. N. of Boston; pop. in 1870, 7,367. It is connected with Charlestown by a bridge 2,420 ft. long. The manufacturing industry of the town is extensive, the chief articles produced being India-rubber boots and shoes, lasts, boot trees, enamelled leather, coach lace and tassels, and iron pipes. There are establishments for dyeing silks, cottons, &c., and staining glass. The town contains a national bank, a savings bank, good public schools, two weekly newspapers, and eight churches.

MALDIVES, or *Malediva Islands*, a chain of small coral islands in the Indian ocean, about 450 m. W. of Ceylon, extending in a straight line from lat. $7^{\circ} 6' N.$ to $0^{\circ} 40' S.$, between lon. $72^{\circ} 48'$ and $73^{\circ} 48' E.$ The length of the chain is about 550 m., and its breadth about 50 m. The number of islands is commonly stated by the natives at 12,000, but is supposed to be in reality nearly 50,000. Their aggregate area is about 2,600 sq. m. The great majority of them are mere rocks or sand banks, and only the larger islands are inhabited. They are divided into 17 atolls or circular groups, each atoll being enclosed by a coral reef, generally about 90 m. in circumference. These reefs have channels through them navigable by the boats of the natives; and though the sea beats with great violence on the outside, the water within the reefs is calm and generally shallow. There are deep channels between the atolls, four of which have been examined by European vessels and found navigable by the largest ships. The principal island is Male, in lat. $4^{\circ} 10' N.$, lon. $73^{\circ} 40' E.$ It is 7 m. in circumference, and contains 2,000 inhabitants. It is the residence of the sovereign, who bears the title of sultan of the Twelve Thousand Isles, and who acknowledges some degree of dependence on the British government of Ceylon, to which he annually sends an embassy with tribute, and receives presents in return. The population of the whole cluster is estimated at from 150,000 to 200,000. The highest land in the islands is only 20 ft. above the sea. Each island is circular in form, and has a lagoon in the centre. The soil is sandy, and at the depth of 3 ft. a layer of sandstone is found. The inhabited islands are richly wooded with palms, fig trees, citron trees, and breadfruit trees. They produce abundance of millet; and of a similar small grain called *brinby*, of both which the inhabitants reap two harvests in the year. They also gather various roots, which, with rice imported from Hindostan, and fish and cocoanuts, constitute their food. The climate is excessively hot, though the nights are cool and the earth is refreshed by heavy dews. The islands are unhealthy for Europeans. From April to October is the rainy season, during which the westerly winds are boisterous.

In the dry season, from October to April, the winds are easterly. The islands breed prodigious numbers of wild ducks, pigeons, and other wild fowl, which are much used for food, and sold very cheap. There are no large quadrupeds except a few sheep and cows. Cats, pole-cats, and ferrets are found, and rats are very numerous and troublesome. There is a poisonous species of water snake, and the mosquitoes are said to be larger and fiercer than in any other part of the East Indies.—The Maldivians are strict Mohammedans. They are handsome, well made, and generally of an olive complexion, though some have much fairer complexions than others, which is probably attributable to their descent from Persian or Arab stock, while the majority of the population are obviously of Hindoo origin. The people are ingenious and industrious, and have attained to some degree of civilization. They clothe themselves in silk or cotton robes, and are cleanly in their habits, both sexes bathing regularly once a day. The men shave their heads, but allow their beards to grow. The women allow the hair to grow long, and fasten it up behind. They are not kept secluded as in other Mohammedan countries, but enjoy a tolerable degree of liberty. The Koran is the supreme law, but there are various peculiar local laws and usages. An insolvent debtor becomes the servant of the creditor until the debt is worked out. The ordinary punishment for criminals is whipping, which is sometimes inflicted so severely as to produce death. Frequently criminals are punished by banishment to the southern islands. The people learn to read and write Arabic as well as their own native language, and they have schools in which the mathematics and navigation are taught. Polygamy to the extent of three wives is tolerated, and divorce is restricted only by the necessity of paying back the dowry received with the wife. The people are a quiet and pacific race, kind and hospitable to strangers, though distrustful of foreigners. They are friendly toward each other, and the ties of kindred are cherished with much affection. The internal commerce of the islands is considerable, for each atoll has its peculiar branch of industry; in one the brewers reside, in another the goldsmiths; locksmiths, mat makers, potters, turners, and joiners, each inhabit exclusively their respective atolls. This division of labor gives rise to a constant intercourse and interchange of commodities, carried on by means of boats, which are sometimes absent for a year from their own islands. Every family, even the poorest, has a boat, and the rich keep several. The multitude of rocks and reefs is so great that this navigation is extremely difficult, and much property is lost by accidents at sea; but the natives being universally good swimmers, their lives are seldom endangered by these shipwrecks. There is some trade with the continent of India, carried on by native boats of about 30 tons burden, built of cocoanut trees. With these boats they

make voyages to Calcutta, Ceylon, Sumatra, the Malabar coast, and other distant parts, carrying coconuts, coir, mats, coconut oil, tortoise shell, dried fish, and cowries, or small shells, which pass as coin over all India. In return they bring home gold and silver, rice, tobacco, cotton and silk goods, and European articles.—The Maldives have been seldom visited by Europeans. The Portuguese touched at Male in the 16th century. In the beginning of the 17th a French merchant vessel was wrecked upon them, and one of the survivors, Pyard de Laval, remained there nearly five years, and wrote an account of the islands, which was published in Paris in 1679.

MALEBRANCHE, Nicolas, a French metaphysician, born in Paris, Aug. 6, 1638, died there, Oct. 13, 1715. In his childhood he was feeble, and was educated at home with great care. Intended for the priesthood, he studied philosophy at the college of La Marche and theology at the Sorbonne, and in 1660 entered the congregation of the Oratory. But he wearied of theological and critical studies, and his philosophical vocation was determined by reading the *Traité de l'homme* of Descartes, which he accidentally met with, and which impressed him so strongly that his perusal was more than once interrupted by palpitations of the heart. From that time (1664) he devoted himself to philosophy, renouncing all other sciences except mathematics, aiming thus to enlighten his mind without burdening his memory. After ten years he produced his principal work, *De la recherche de la vérité* (Paris, 1674), which received numerous additions, and in its 6th edition (1712) extended to four volumes. It was translated into English by Richard Sault (2 vols. 8vo, London, 1692-4; 2d and 3d eds. by Thomas Taylor, fol., 1700 and 1720). In 1677 he published *Conversations métaphysiques et chrétiennes*, a discussion on the relation of philosophy to religion and Christian dogmas, which involved him in a long controversy with theologians and Cartesian metaphysicians, especially with Arnauld and Régis. In 1699 he was elected an honorary member of the academy of sciences. Withering slowly away, till he was hardly more than a skeleton, he died "a tranquil spectator of his own long dissolution." His later more important publications, partly philosophical and partly religious, were the *Traité de la nature et de la grâce* (1680); *Méditations métaphysiques et chrétiennes* (1683); *Traité de morale* (1684); *Entretiens sur la métaphysique et sur la religion* (1687); and *Réponses de Malebranche à Arnauld* (4 vols., 1709). A complete edition of his works was published at Paris in 1712, in 11 vols.—The philosophical system of Malebranche begins with the admission of the Cartesian doctrine that mind and matter are utterly opposed and mutually impermeable, the mind knowing nothing but its own states, which it sees in self-consciousness. It is like one in the dark, who can perceive nothing but

himself. To this he added that we are able to see external objects in God, who is the light of our knowledge. He is the absolute substance, in whom exist alike the persons who know and the ideas which they know. He is the home of the world of ideas, as space is the home of physical bodies; and in him the mind knows objects other than itself. Malebranche recognized, with Descartes, three substances: the thinking, the extended, and the infinite substance, or the soul, matter, and God; but there is throughout his system a tendency to reduce them to one. In Descartes they describe excentric circles; in Malebranche they are concentric, including each other. Matter is grasped by the soul, and souls by the Deity; ideas enter the mind, the mind itself existing in God. Thus he marks the transition from Descartes to Spinoza, recognizing a personal God, but with pantheistic forms of thought, tending to reduce spirit and matter to one absolute substance. His most important works are contained in the edition by De Genoude (Paris, 1837), and in an edition by Jules Simon (2 vols., Paris, 1853). *La philosophie de Malebranche*, by Ollé-Laprune, received a prize from the French academy in 1872.

MALE FERN (*aspidium filix-mas*). Theophrastus and other ancient writers mention two kinds of fern, the male and female; whether or not this was the fern referred to as the male, it retains the name in common as well as in botanical nomenclature. There are something over a dozen aspidiums or shield ferns found in this country, some of which are very common, while a few, including the male fern, are exceedingly rare; this, while one of the



Male Fern.

common ferns of Europe, has thus far been found here only at Lake Superior. It has a large scaly root stock, from which arise the handsome fronds in a circular tuft, 2 to 3 ft. high and of the outline shown in the engraving; its elegant appearance makes it a desirable

plant for the outdoor fernery, but its chief interest lies in the use that has been made of the root stock in medicine. It was known to the ancients as an anthelmintic, but attention was called to it anew by the widow of a Swiss surgeon, Mme. Nouffer, who had such great success in expelling tapeworms that Louis XIV. paid her 18,000 francs for her secret; it was found that her principal remedy was the root of the male fern, which was aided by powerful purges. The root stocks are collected when 3 to 6 in. long and dried, in which state they are kept in the shops; the male fern roots, as they are called, contain about 10 per cent. of oily and resinous matters, upon which their worm-destroying properties depend; the oil of male fern is an ethereal extract, and contains such constituents of the roots as are soluble in that menstruum. Like other agents for the destruction of tapeworms, it has had a varying reputation, some attributing its efficacy solely to the active cathartics used with it; on the other hand, it is asserted that while it is effective against the unarmed tapeworm, common among the Swiss, it has much less or very little effect upon the armed tapeworm, the one most common in this country. The medicine appears to act as a poison upon the worm, which is then easily expelled. The dose of the powdered root is two or three drams, or of the oil half a dram, followed by castor oil.

MALESHERBES, Chrétien Guillaume de Lamignon de, a French statesman, born in Paris, Dec. 6, 1721, guillotined April 22, 1794. Of an illustrious family, son of a chancellor of France, he was educated in the Jesuits' college, became counsellor of the parliament of Paris in 1744, succeeded his father in the presidency of the court of aids in 1750, and was at the same time appointed superintendent of the press. He favored the publication of the *Encyclopédie* and other works of its authors in defiance of the anathemas of the Sorbonne. He protested in 1770 and 1771 against the imposition of new taxes and the abuses of *lettres de cachet*, for which he was banished from Paris. After the accession of Louis XVI. in 1774, he was called into the ministry with Turgot, and the department of Paris and the police of the kingdom was intrusted to him. His counsels were rejected, and he resigned in 1776 when Turgot was dismissed. He passed the time until the revolution in travels in France, Holland, and Switzerland, and in the pursuits of literature, with the exception of a brief interval in 1787 when he was called into the ministry. When Louis XVI. was arraigned before the national convention in 1792, Malesherbes obtained the dangerous honor of pleading his cause, and was one of the last to take leave of the condemned monarch. Eleven months afterward he was arrested with his family by the revolutionary tribunal, and condemned with them to the scaffold. His *Discours et remontrances* (1779) are valuable with reference to financial questions, and his paper *Sur la liberté de la presse*

(1809) is remarkable for its enlightened views. A monument was erected to his memory under the restoration.—See Boissy d'Anglas, *Essai sur la vie, les opinions et les écrits de Malesherbes* (2 vols., 1818), and Sainte-Beuve, *Malesherbes, in Causeries du lundi*, vol. ii.

MALET, Claude François de, a French conspirator, born in Dôle, June 28, 1754, executed in Paris, Oct. 29, 1812. In 1799 he distinguished himself in the army during the passage of the Little St. Bernard, and was made brigadier general. He disapproved of the promotion of Bonaparte to the consulate, but apparently adhered to the empire, expressing in a letter to Napoleon a hope of its becoming beneficial to and not destructive of liberty. But Prince Eugène expelled him from his headquarters in Italy, on the charge of conspiring against the emperor, and he was imprisoned during ten months till May, 1808, and soon rearrested. In prison he continued to plan conspiracies with other opponents of Napoleon, especially in 1809, after the defeat at Essling, but this attempt was abortive. The emperor ordered him to be transferred from La Force to a regular state prison, but Fouché neglected to do so, and even permitted him in June, 1812, to remove to a private sanitary asylum. Here he met the Polignacs and Abbé Lafon, the principal Bourbon agents, while his wife, the corporal Rateau, and others worked against Napoleon in the interior of the country. Malet's plot was ripe in October, when he deemed the anxiety respecting the Russian campaign favorable for its execution. In the night of Oct. 23-24, when the disastrous retreat from Moscow became known, he announced to the garrison of Paris the death of Napoleon, and at first met with some success, with the aid of his confederates, and by promising rewards to those who would join him. He shot dead the recalcitrant Gen. Huillin, commander of the first division, but was disarmed by two officers, who disclosed the deception which had been practised, and the populace responded with the cry, *Vive l'empereur*. The whole plot fell to the ground, and Malet was sentenced to death. His wife was arrested; and as she subsequently received a pension, and her son an appointment, from Louis XVIII., it was supposed that Malet had conspired in the interest of the Bourbons, but it is generally believed that he was a sincere republican.

MALHERBE, François de, a French poet, born in Caen in 1555, died in Paris, Oct. 16, 1628. While young he studied at Heidelberg and Basel, and afterward bore arms in the wars of the league. He acquired some reputation in 1600 by an ode on the arrival in France of Maria de' Medici. In 1605, having gone to Paris on business, Henry IV. sent for him, praised his talents, and provided him with the means of remaining at court. After the death of Henry IV. his widow, Maria de' Medici, settled on Malherbe a pension of 500 crowns, "in gratitude for the ode addressed to her." He

was noted for his avarice, his pretended contempt of poets, his fondness for female society, his wit, and his dilettantism in language. He wrote for the most part light lyrics, odes, stanzas, epigrams, sonnets, and a few devotional pieces. The latest edition of his works is that of M. L. Lalanne (4 vols., Paris, 1865).

MALIBRAN, Maria Felicia, a Spanish singer, born in Paris, March 24, 1808, died in Manchester, England, Sept. 23, 1836. She was the eldest daughter of the singer and instructor Manuel Garcia, by whom she was taken when nine years old to England, where she remained for a number of years. Her father instructed her in singing, and by her 17th year she had acquired so great a facility that on June 7, 1825, she was enabled to make her début in London as Rosina in the *Barbiere di Siviglia*, on the occasion of the sudden departure of Mme. Pasta, who was to have undertaken the part. She sang with success in other operas and at private and public concerts in London, Manchester, and Liverpool, during the same season, giving promise of great future eminence; and in the autumn of 1825 she accompanied her father to the United States as prima donna of an opera company of which he had assumed the direction. She appeared in New York, Nov. 29, in the part of Rosina, the occasion being memorable in musical annals as that which witnessed the introduction of the Italian opera into the United States. Her reception was enthusiastic, and she appeared successively in a number of parts, each of which subsequently became a perfect creation in her hands. In the midst of her triumphs she was married, March 23, 1826, to Eugène Malibran, an elderly French merchant of New York, reputed to be possessed of considerable wealth. He afterward failed, and Mme. Malibran, offended by the readiness with which her husband sought to retrieve his fortunes by her professional labors, surrendered to his creditors the property settled upon her as a marriage dower, and in September, 1827, returned alone to Europe. From Jan. 14, 1828, when she made her first appearance before a Parisian audience, until the close of her life, her career was prosperous and brilliant. She was accustomed to spend the winter in Paris and the spring and autumn in England and the larger continental cities; and on two occasions she made professional tours to Naples, Milan, and other Italian cities. The French courts having in 1835 pronounced her marriage with M. Malibran void, she was married, March 29, 1836, to De Bériot, the celebrated violinist. In April following she was injured by a fall from her horse; but professing to make light of the matter, she appeared in opera in Brussels and at Aix-la-Chapelle during the summer. In September she went to the Manchester musical festival, and, contrary to the advice of her physician, took part in the performances. A nervous fever set in, which soon proved fatal. —Mme. Malibran was one of the first singers

of the age, and her dramatic ability was scarcely less remarkable than her vocal. Her voice, a mezzo-soprano approaching a contralto, of great volume and purity, had been brought to almost absolute perfection by the severe training of her father; and in the variety and beauty of her vocal embellishments, as well as in the felicity and dramatic propriety with which she interpreted her music, she has rarely been equalled. Her range included some of the finest rôles, both tragic and comic, in the operas of Rossini, Bellini, and Mozart, including those of Rosina, Semiramide, Tancredi, Desdemona, Romeo, Zerlina, Ninetta, Cenerentola, and Amina. She also sang with wonderful effect the sublime music of Handel's oratorios, and many choice selections from Gluck and others. Her personal qualities accorded with her lyrical genius, and few women have been more beloved for their amiability, generosity, and professional enthusiasm. Her benefactions amounted to such considerable sums that her friends were frequently obliged to interfere for the purpose of regulating her finances. Her intellect was of a high order, and the charms of her conversation fascinated all who were admitted into the circle of her intimate friends. She was also an accomplished linguist, speaking fluently and singing in the chief languages of Europe. She composed several songs, nocturnes, and romances, some of which have been published. A memoir of her, by the countess of Merlin (2 vols.), appeared in England soon after her death, and was republished in the United States.

MALINES. See MECHLIN.

MALLARD. See DUCK.

MALLET, Charles Auguste, a French philosopher, born in Lille, Jan. 1, 1807. He studied at the normal school, and was professor in various colleges of the interior till 1842, when he was called to the collège St. Louis in Paris. From 1848 to 1850 he was inspector of the academy of Paris, and afterward rector of the academy of Rouen, retiring in 1852. His principal works are: *Études philosophiques* (2 vols., Paris, 1837-'8; 2d ed., 1843); translation of Beattie's "Elements of Moral Science" (2 vols., 1840); *Histoire de la philosophie ionienne* (1842); *Histoire de l'école de Mégare et des écoles d'Élée et d'Érétrie* (1845); and *Éléments de morale* (1864).

MALLET, David, a Scottish author, born at Crieff, Perthshire, about 1700, died in London, April 21, 1765. His original name was Malloch, which he changed to Mallet in 1726. He was educated at Aberdeen, and settled in London as a literary man. In 1733 he published a poem entitled "Verbal Criticism," which so pleased Pope that he introduced him to Bolingbroke, who obtained for him the office of under secretary to Frederick, prince of Wales, with a salary of £200. From the Newcastle administration he got a pension, said to have been the reward of his attacks on Admiral Byng. His pen was always at the service of those who

would pay for it, not sparing even his old friend Pope, whom after his death, at the instigation of Bolingbroke, he assailed in his preface to that nobleman's "Idea of a Patriot King." Bolingbroke made him his literary executor, and the duchess of Marlborough left by her will the sum of £1,000 to Glover and Mallet jointly, provided they drew up from the family papers a life of the great duke. Glover declined, but Mallet accepted, and on pretence of being engaged upon the work received for the rest of his life a pension from the second duke. On his death, however, it was found that he had never written a line of it. A collection of Mallet's works was published by himself (3 vols., 1750). A new edition of his songs and ballads, by Frederick Dinsdale, appeared in 1857.

MALLET, Paul Heuri, a Swiss historian, born in Geneva, Aug. 20, 1730, died there, Feb. 8, 1807. After completing his education he went to Copenhagen, where he was appointed regius professor of belles-lettres in 1752. He employed his leisure in studying the language, history, and archæology of the ancient Scandinavians, and wrote his *Introduction à l'histoire de Danemark* (Copenhagen, 1755-'6). In 1760 Mallet returned to Geneva, and filled the chair of history in the college of that city for four years. The most important of his works, besides that above named, are: *Histoire de Danemark* (3 vols. 4to, Copenhagen, 1758-'77); *Mémoires sur la littérature du nord* (6 vols. 8vo, Copenhagen, 1759-'60); *Histoire des Suisses* (4 vols. 8vo, Geneva, 1803); and *Histoire de la ligue Hanséatique* (Geneva, 1805). His *Introduction à l'histoire de Danemark* was translated into English by Bishop Percy, under the title of "Mallet's Northern Antiquities" (2 vols. 8vo, London, 1770; new ed., by I. A. Blackwell, 1 vol. 12mo, 1847).

MALLOW, a common name for plants of the genus *malva* (from Gr. *μαλάσσειν*, to soften, in allusion to their softening and emollient properties). The genus, as at present restricted, includes about 16 species, none of which are indigenous to this country, though several of them are more or less extensively naturalized; it is the type of the natural order *malvaceæ*, which comprises many kindred genera distinguishable mainly in the structural differences of the fruit, but all agreeing in having their stamens united into a tube by their filaments, and in having one-celled anthers; about 700 species are known, distributed among 59 genera. It is remarkable that none of the order possess any unwholesome qualities, while all abound in mucilage. The wild or high mallow (*M. sylvestris*) is a handsome biennial, with an erect stem and kidney-shaped leaves having five to seven deeply crenate lobes; the flowers are large, of a purple or a rosy color, the calyx hairy, the carpels wrinkled. It grows on waste places and roadsides in Europe, and is an introduced and naturalized weed in the older portions of this country. For fomentations and poultices, its properties

are not inferior in value to those of the marsh mallow (see *ΑΙΘΥΛΑ*), and decoctions of its leaves have been used in dysentery and urinary troubles. This is the *mauve* of the French, who use the dried flowers in preparing a *tisane*, or diet drink, which is in great repute with them;



Wild Mallow (*Malva sylvestris*).

the name *mauve* is also applied to a dye resembling the flowers of this plant in tint. By far the most common with us is the familiar weed known as common or dwarf mallow (*M. rotundifolia*), so abundant by the wayside, in rich shaded dooryards, and cultivated grounds generally. Its stems are prostrate, spreading, and spring from a long, deeply buried root; its leaves are round-heart-shaped, somewhat lobed and crenate on their edges; the flowers small, whitish, with purplish veins. The plant is much prized by children, who in play seek its flat and circular mucilaginous fruits under the name of "cheeses." The musk mallow (*M. moschata*) is a low perennial, sometimes cultivated in gardens, from which it has to some extent escaped, and is occasionally found naturalized along waysides; it has handsome, deeply cut leaves, diffusing a pleasant, musky fragrance, and large rose-colored or white flowers. The curled mallow (*M. crispa*) is likewise seen in old gardens, conspicuous for its large, strong, tall stem, and rich, deep green, singularly curled foliage, the beauty of which supplies the defect of its flowers, which are rather inconspicuous. The hollyhock mallow (*M. Alcea*), a European perennial species about 3 ft. high, with palmately five-cleft leaves and rosy-purple flowers 2 in. across, is cultivated and has become naturalized in some parts of Pennsylvania. The American species formerly placed in *malva* are mostly now in the genus *malvastrum*.—There are many very showy flowers belonging to the order *malvaceæ*, such as those of *Lavatera*, *malope*, *abutilon*, and *sida*, prized in border and greenhouse cultivation.

MALMAISON, La, a village of France, in the department of Seine-et-Oise, about 7 m. W. of the encinte of Paris, noted for a palace which became celebrated through Josephine, the first wife of Napoleon I. The Norman pirates committed ravages in this vicinity in the 9th century, and the locality was thence called *mala mansio* ("evil spot"). In the 17th century it was owned by Christophe Perrot, councillor of the parliament of Paris, styling himself lord of Malmaison. Afterward it had various proprietors; and from Mme. Harenc, who received here many literary and scientific notabilities, it passed into the possession of M. Le Couteulx, who in 1798 sold the domain to Josephine for 160,000 francs. She made it a brilliant centre of fashionable and intellectual society, enlarging and embellishing the grounds after the model of Marie Antoinette's Trianon, furnishing it with a good library, and adding many fine pictures and other works of art to the collections. The château itself, however, retained a rather unseemly appearance. Bonaparte often resided here previous to his removal to St. Cloud, and Malmaison preserved great prestige until the establishment of the empire in 1804. After her divorce (Dec. 16, 1809) Josephine kept up here the semblance of a court, and she was frequently visited by Napoleon, who also spent several days here with Hortense after the battle of Waterloo. The emperor Alexander, as well as the king of Prussia and his son, visited Josephine at Malmaison, on the first occupation of Paris. After her death here (May 29, 1814) the property reverted to her son, Eugène de Beauharnais. The Swedish banker Haguerman purchased it in 1826, reducing the grounds to their original small dimensions. He sold it in 1842 to the dowager queen Maria Christina of Spain for 500,000 francs, and she resold it in 1861 for 1,500,000 francs to Napoleon III., who had it restored. Among the works which he collected here are Isabey's painting of "Bonaparte at La Malmaison," Hortense's portrait of herself, and a portrait of Josephine. The room which Napoleon used to occupy contains the bed on which he died at St. Helena.

MALMESBURY, a parliamentary borough of Wiltshire, England, on the Avon, which is here crossed by six bridges, 82 m. W. of London; pop. in 1871, 6,880. Formerly the manufacture of woollen cloth was the chief branch of industry, but it has given way to wool-stapling. The parish church is a portion of a famous old Saxon nunnery, and contains a tomb reputed to be that of King Athelstane. The town is the birthplace of the philosopher Hobbes.

MALMESBURY. I. James Harris, first earl of, an English diplomatist, born in Salisbury, April 21, 1746, died in London, Nov. 20, 1820. He was the eldest son of James Harris, secretary and comptroller to Queen Charlotte, and author of "Hermes," studied at Oxford and Leyden, and was appointed in 1767 secretary of legation at Madrid. He was for four years Eng-

lish ambassador in Berlin, and from 1777 to 1784 in St. Petersburg. In the house of commons he was the follower of Fox, after whose withdrawal from the cabinet he received from Pitt the appointment of ambassador at the Hague, and in September, 1788, was raised to the peerage as Baron Malmesbury, having been knighted in 1780. In 1793 he joined the party of Pitt, who again appointed him to a mission to Berlin. In 1794 he negotiated the marriage between the prince of Wales and Caroline of Brunswick, and accompanied the bride to England. In 1796 and 1797 he was employed in fruitless negotiations for peace with the French republic. Becoming deaf, he spent the rest of his life in retirement. In 1800 he was created Viscount Fitz-Harris and earl of Malmesbury.

II. James Howard Harris, third earl of, grandson of the preceding, born in London, March 25, 1807. He studied at Eton and at Oxford, where he graduated in 1828. He was returned to the house of commons for the family borough of Wilton in June, 1841, and in September succeeded his father in the house of lords. He was secretary of state for foreign affairs in the Derby administration from March to December, 1852; and being a personal friend of Louis Napoleon, he was among the first to urge the recognition of the second empire. He was reappointed foreign secretary in March, 1858, but resigned in April, 1859. He was lord keeper of the privy seal from 1866 to the end of 1868, when he retired on account of failing health. Besides editing the "Diaries and Correspondence" of his grandfather (4 vols., London, 1844), he has published "The First Lord Malmesbury, his Family and Friends: a Series of Letters from 1745 to 1820" (2 vols., 1870).

MALMESBURY, William of, an English historian, born in Somersetshire about 1095, died at Malmesbury about 1143. He was destined for the church, and early entered the monastery of Malmesbury, of which he became librarian. Several of his numerous works were published by Sir Henry Savile in 1596, in his *Scriptores post Bedam*. His "History of the Kings of England" and "Modern History" (*De Gestis Regum* and *Historia Novellæ*), the former translated by the Rev. John Sharpe (London, 1815), were reprinted in 1847 in Bohn's "Antiquarian Library."

MALMÖ (Swedish, *Malmöhus*). **I.** A län or province of Sweden, bordering on Christianstad, the Baltic, and the Sound; area, 1,852 sq. m.; pop. in 1873, 322,175. It is one of the most fertile portions of Sweden, rears the best horses and cattle, and produces excellent cheese and great quantities of grain. It contains several lakes, of which the largest is Lake Ring. **II.** A city, capital of the län, on the Sound, 16 m. S. E. of Copenhagen; pop. in 1873, 27,485. It consists of the town proper and two suburbs, Öster and Wester Wårn, connected with it by a canal. The streets are spacious, and the market place is planted

with trees. The former fortifications have been converted into promenades. The ancient castle of Malmö is used for barracks, and for a prison and penitentiary. Two churches, the old town hall, and the theatre are among the conspicuous buildings. There are a gymnasium and schools of technology and navigation. Among the charitable institutions is a richly endowed lunatic asylum. Steamboats, railways, and especially the improvement of the harbor, have greatly promoted the maritime and commercial importance of Malmö. About 5,000 vessels enter and leave the port annually. The principal export is grain.

MALMSEY. See GREECE, WINES OF.

MALONE, Edmond, an Irish Shakespearian scholar, born in Dublin, Oct. 4, 1741, died in London, May 25, 1812. He graduated at Trinity college, Dublin, and was called to the bar in 1767; but having inherited a considerable fortune, he removed to London, devoting himself to literary pursuits. In 1780 he published two supplementary volumes to Steevens's edition of Shakespeare, and in 1790 his own edition of the great dramatist appeared in 11 vols. 8vo. In 1796 he exposed the Shakespearian forgeries of Samuel Ireland. At his death he left a greatly improved edition of his Shakespeare, which was published in 1821, under the supervision of James Boswell, in 21 vols. 8vo. He edited "The Prose Works of John Dryden, with a Memoir;" "The Works of William Gerald Hamilton, with a Sketch of his Life;" "The Works of Sir Joshua Reynolds," and other works.—See "Life of Edmond Malone," by Sir James Prior (London, 1860).

MALPIGHI, Marcello, an Italian anatomist, born near Bologna in 1628, died in Rome, Nov. 29, 1694. In 1656 he was appointed by Ferdinand II. of Tuscany professor of medicine at Pisa, where he made the acquaintance of the celebrated mathematician Borelli, who first convinced him of the propriety of applying experimental researches to the elucidation of physical science. Ill health, however, soon compelled his return to Bologna, where he continued to practise as a physician till 1662, when he was called to a professorship at Messina. In 1691 he was invited to Rome by Innocent XII., who appointed him his chief physician and chamberlain. His reputation is mainly due to the fact that he was the first to employ the simple microscope, then recently invented, in investigating the anatomical structure of plants and animals, and particularly upon his discovery by this means of the capillary circulation of the blood from the arteries to the veins. Harvey had already in 1628 demonstrated the circulation of the blood as a whole; that is to say, the return of the blood which had passed out from the heart by the arteries back again to the heart by the veins. The mode in which the blood passed through the substance of the tissues, from the arteries to the veins, was however still unknown; and no doubt it was partly this fact which prevented

ed the ready acceptance of Harvey's doctrine by the anatomists of the time. But in 1661 Malpighi saw with the microscope the circulation of the blood through the capillaries in the frog's lung, and afterward in the mesentery; thus demonstrating its passage by minute canals from the arteries to the veins, and supplying the only deficiency which had existed in Harvey's discovery. His name has been perpetuated in that of several anatomical textures discovered and described by him, viz.: the *rete Malpighianum* of the epidermis, the Malpighian bodies of the spleen, and the Malpighian tufts of the kidney. His principal works are: *Observationes Anatomicae de Pulmonibus* (fol., Bologna, 1661); *De Viscerum Structura Exercitationes Anatomicae* (1666; many times reprinted and translated into French); *Dissertatio Epistolica de Formatione Pulli in Ovo* (London, 1673); *Dissertatio Epistolica de Bombyce* (London, 1669); *De Pulmonum Substantia et Motu* (Leyden, 1672); *Anatome Plantarum* (London, 1675-'9); and *Epistola de Glandulis Conglobatis* (London, 1689). The only complete collective edition of his works was published at Venice in 1743.

MALPLAQUET, a village of France, in the department of Le Nord, 10 m. S. by W. of the Belgian town of Mons, celebrated for a battle between the allied forces under Marlborough and Prince Eugene, and the French under Marshal Villars, Sept. 11, 1709. The battle commenced at 8 o'clock in the morning, the principal attack of the allies being directed upon the enemy's left, where Villars himself held command. The French at first repelled their assailants, but Villars having become disabled by a wound, the allies succeeded in forcing the position; and the French, in spite of desperate efforts by the new commander, Boufflers, and the chevalier St. George, son of James II., eventually succumbed, though they effected their retreat in good order. In this battle, the bloodiest in the war of the Spanish succession, the allies, who brought into the field 80,000 men and 140 guns, lost in killed and wounded more than 20,000 men; the French, who numbered 70,000 men with 80 guns, lost more than half that number; but some accounts place the loss on both sides as high as 42,000. During the battle Marlborough exposed himself to frequent perils, and the report of his death, which was at one time prevalent in the French ranks, gave rise to the once popular military refrain: *Malbrook s'en va t'en guerre*, which was reproduced from a song of the 16th century on the death of the duke of Guise.

MALT. See BREWING.

MALTA (anc. *Melita*), a British possession in the Mediterranean, including the islands of Malta, Gozo, and Comino, and the uninhabited islets of Cominotto and Filfla, the entire group lying between lat. 35° 43' and 36° 5' N. and lon. 14° 10' and 14° 35' E., about 60 m. S. W. of the southernmost point of Sicily, and

200 N. of Tripoli in Africa; area, about 145 sq. m.; pop. in 1872, 143,799, exclusive of the troops. The area of Malta proper is about 100 sq. m.; pop. about 130,000. There are neither lakes nor rivers in the island, and no forests or brushwood; and most of the surface is a calcareous rock exposed to the winds from the African deserts, and but thinly covered with an artificial soil, chiefly brought from Sicily. This is, however, by careful cultivation made to yield abundant crops of cotton, grains, beans, and grass, and excellent fruits, of which the orange, olive, and fig are renowned. In summer the heat is excessive day and night. The sirocco prevails especially in autumn, and there is little land or sea breeze. But in winter the climate is delightful. The atmosphere is so clear that at all times of the year the summit of Mt. Etna may be distinctly seen during the rising or setting of the sun, although at a distance of 130 m. The E. portion of the island contains all the towns and villages, and is separated by a ridge from the W. part, which, although less densely settled, is well cultivated, and abounds with the wild thyme and other odoriferous plants, attracting bees, which furnish excellent honey. There are about 25,000 head of live stock, including about 6,000 cattle. Cotton is the staple product, and gives rise to an extensive manufacture of cotton goods. The cabinet work of Malta enjoys a high reputation. Soap, leather, macaroni, and iron bedsteads are manufactured to some extent. The goldsmiths are noted for their elegant workmanship, and the Maltese artisans are generally able and intelligent. They are excellent seamen, and their services are in great demand in the Mediterranean. But the bulk of the people are either employed in agricultural labor or in stone cutting.—The island of Gozo or Gozzo, about 9 m. long and 5 m. broad, lies N. W. of Malta, and is separated from it by a channel 3 m. wide. It is surrounded by a belt of rocks and shoals, with openings leading to several small harbors. The interior is very rocky and hilly, with a thin soil, which however is very fertile. Grain and fruit are raised in abundance; but the most important crop is cotton, much of which is spun on the island. There are salt works at Port Maggiore, on the S. side, and an alabaster quarry in the northwest. The highest point of land is near the centre of the island, and is crowned with the fort of Rabato. The principal town is Rabato (pop. about 2,000), and there are several villages. The island contains a great natural curiosity called the Giant's Tower, and several Roman monuments. Comino, about 2 m. long and $1\frac{1}{2}$ m. broad, lies in the channel between Malta and Gozo. The surface is very hilly and the coast deeply indented. The principal settlement is Santa Maria.—The Maltese are derived from an Arabic stock; it is probable, however, that the Arab conquerors have been mixed up with the previous Punic population. Greek is supposed to have been

in ancient times the medium of conversation of the higher classes, as English is at the present day. The present common language is the *lingua franca*, a *patois* of the Arabic, mixed with Italian and other languages. The complexion of the Maltese is almost as dark as that of the natives of Barbary. The dress of the working classes is a short loose waistcoat, covering a cotton shirt, short loose trousers, woollen caps in winter and straw hats in summer, and a kind of sandals resembling those of the ancient Romans. The women are of dark complexion, and are small, delicate, and generally graceful, and wear in the streets a black veil (*faldetta*). The dress consists mostly of a cotton shift, blue striped petticoat, a corset with sleeves, and a loose jacket covering the whole. Drunkenness is almost unknown, and the people, although coarser in their appearance, are less vindictive and impulsive than other races of southern Europe. They are fond of poetry, especially in the rural districts, where the taste for improvisation prevails extensively. In music they prefer noisy instruments, as the tambourine, mandoline, and particularly the bagpipe, which accompany the national dances. They marry at an early age. Many of them seek employment in the Levant, where they are however exceedingly unpopular on account of their crafty and treacherous nature, and they are generally employed only in the meanest labors. The families ennobled by the knights of Malta have dwindled down to a small number; and the few which remain are not very affluent. The national religion is Roman Catholic, under the direction of a bishop and more than 1,000 priests, the church property being considerable. The number of Protestants is about 5,000, whose places of worship consist only of a few chapels. Education is promoted by the university of Valetta, colleges at Città Vecchia and several other places, and about 50 public and 100 private schools.—The value of imports paying duty in 1871 was \$37,400,000; of exports, \$37,500,000. The number of steamers arrived in 1871 was 1,737, tonnage 1,466,000; of sailing vessels arrived, 2,954, tonnage 519,000; total number of vessels, 4,691, tonnage 1,985,000. The direct trade with the United States is inconsiderable, but a large number of American vessels are engaged in the trade of foreign countries with Malta. A new government grading dock, capable of receiving the largest men-of-war, has been recently opened, and new submarine telegraphs have been laid connecting Malta with Algiers and Alexandria. The hydraulic lift dock, completed in 1873, is of great benefit to commerce, especially to the steamers of the India route, as by means of it vessels can be repaired without discharging their cargo. The revenue in 1870 was £158,630; expenditures, £171,788; public debt, £79,202.—Malta is a crown colony, the local government being conducted by a governor who is

at the same time commander-in-chief, assisted in legislative matters by a council of 18 members, of whom 10 are official and 8 elective. The British troops and their families in December, 1872, numbered 6,752 persons. The duties of the native regiment, called the Malta fencibles, are exclusively local, and their maintenance is defrayed out of the revenues of the islands. The central position, military strength, and excellent harbor, one of the most commodious and convenient in the Mediterranean, render the possession of Malta of great importance to Britain, and make it very advantageous for the accommodation and repair of the men-of-war and merchant ships frequenting the Mediterranean. The storehouses or *caricatori* for grain are excavated in the rock, making Malta an excellent centre of the corn trade between the Mediterranean and Black seas.—Besides Valetta and Città Vecchia, and a few other towns, Malta possesses about 40 casals or hamlets, chiefly remarkable for their picturesque churches. The former capital of Malta was Città Vecchia. The present capital, Valetta, is one of the best fortified places in the world, and serves as a station for the Mediterranean fleet.—The ancient Melita was important as a commercial centre among the nations of antiquity, and it was occupied probably at a very early period by a Phœnician colony. Afterward it became a Carthaginian settlement. At a later period it appears to have been in a measure Hellenized, though there is no historical evidence of its having been in the possession of the Greeks. In 257 B. C. it was ravaged by a Roman fleet under Atilius Regulus; and surrendering to the Romans at the beginning of the second Punic war, it was annexed to the province of Sicily. It became notorious as a resort of the Cilician pirates, but was in a flourishing condition in the days of Cicero, who during periods of disturbance entertained the project of retiring thither. The Maltese cotton fabrics (*vestis Melitensis*) were in great demand in Rome, and they were probably manufactured from the cotton which still forms the principal product of the island. In sacred history Malta is celebrated as the supposed scene of the shipwreck of St. Paul on his voyage to Italy (A. D. 60); though according to some critics Melita (now Meleda) in the Adriatic, on the coast of Dalmatia, was more probably the island visited by the apostle. After the fall of the Roman empire the island was for some time in the possession of the Vandals, but was taken from them by Belisarius (533), and was subject to the Byzantine empire until the latter part of the 9th century, when it was conquered by the Arabs. It was wrested from them at the close of the 11th century by Count Roger, the Norman conqueror of Sicily, and it was united with Sicily until the early part of the 16th century, when Charles V. took possession of that country and of Malta as heir of Aragon. Under this emperor the knights of Malta (see SAINT

JOHN, KNIGHTS OF) became its sovereigns, and held it till 1798, when the French expedition to Egypt under Napoleon seized the island. After the battle of the Nile the inhabitants rose in insurrection and compelled the French to shut themselves up in the fortress of Valetta. They were subjected to a stringent blockade until Sept. 5, 1800, when, reduced by famine, they surrendered to the English, who had come to the assistance of the Maltese. The island has since remained under British rule.

MALTE-BRUN. I. A Danish geographer, whose actual name was MALTRE CONRAD BRUN, born at Thisted in Jutland, Aug. 12, 1775, died in Paris, Dec. 14, 1826. He studied in Copenhagen, devoting himself especially to literature and politics. He embraced republican principles, and in 1795 published a pamphlet entitled "Catechism of the Aristocrats," for which he was prosecuted by the government and obliged to take refuge in Sweden. A poem on the death of Bernstorff which he published during his exile procured for him permission to return to Denmark. But another pamphlet against the aristocracy subjected him to a new prosecution, and he left his country, and finally took up his residence in Paris. In December, 1800, the Danish courts pronounced sentence of perpetual banishment against him, which was rescinded about the time of his death. In Paris he wrote largely for various journals, and in 1806 became one of the principal writers for the *Journal des Débats*. He at first opposed the consular government, but subsequently became a zealous imperialist, and after the fall of Napoleon an equally zealous monarchist, publishing in 1824 *Traité de la légitimité considérée comme base du droit public de l'Europe chrétienne*. In the mean time he devoted himself especially to geographical studies, and in 1803, in conjunction with Mentelle and Herbin, commenced the publication of *Géographie mathématique, physique et politique*, which was completed in 1807, comprising 16 volumes. In 1808 he established the periodical *Annales des Voyages*, which was discontinued in 1814, and resumed in 1819, with the collaboration of Eyries, under the title, *Nouvelles Annales des Voyages*, and is still issued under charge of his son. He was one of the founders of the geographical society, of which he became secretary. He wrote a number of miscellaneous works, among which is a posthumous collection, *Mélanges scientifiques et littéraires* (3 vols., 1828). His most important work is *Précis de géographie universelle* (8 vols., 1810-'29, the last two volumes being by Huot). This has been several times republished, the last edition by Lavallée (6 vols., 1856-'7). It was translated into English, and an edition published at Boston; with notes and additions by James G. Percival (3 vols. 4to, 1828-'32), and one at Philadelphia (5 vols. 8vo, with atlas, 1832-'7). II. **Victor Adolphe**, a French geographer, son of the preceding, born in Paris in 1816. After having been profes-

sor of history in several colleges, he devoted himself especially to geographical studies. He is secretary of the geographical society, and principal editor of the *Nouvelles Annales des Voyages*, and has published numerous works relating to geography. Among these are: *Jeunes voyageurs en France* (1840); *Destinée de Sir John Franklin dévoilée* (1860); *Nouvelles acquisitions des Russes dans l'Asie orientale* (1861); *Les États-Unis et le Mexique* (1862); *Coup d'œil sur le Yucatan, and Sonora et ses mines* (1864); *Canal interocéanique du Darien* (1865); *Histoire de Marcoussis* (1867); and *Histoire géographique et statistique de l'Allemagne* (4to, 1866-'8). He has also issued a revised edition of his father's geography (8 vols., 1852-'5), and, in conjunction with others, *France illustrée* (3 vols., 1855-'7).

MALTHA (Gr. *máltha*, soft wax; also denoting a mixture of wax and pitch, used for the surface of writing tablets, and for some kinds of cement). Pliny describes under this name an inflammable mud flowing from a pool at Samosata, on the Euphrates, which he says was similar in nature to naphtha; and this use of the word has led to its later application to viscid bitumens. It is the proper name for mineral tar, or all bitumens having the consistence of tar, and holding water and air in mechanical admixture in consequence of their viscosity. It occurs on the surface of the ground and issuing from springs, often accompanied by water, in various parts of the world, but most frequently in localities noted for the production of petroleum, for which substance maltha is frequently mistaken. It appears to be a product of the partial oxidation or decomposition of certain unstable varieties of petroleum, and doubtless in all cases has a common origin with it (see PETROLEUM), as it passes by insensible degrees into petroleum on the one hand and asphaltum on the other. It is found in this country throughout the length of California, in Texas, and at various places in the southwest, on both flanks of the Rocky mountains, and in Alaska. Among foreign localities may be mentioned Enniskillen in Canada, the islands of Barbadoes and Trinidad, many localities in South America, some of the islands of the Grecian archipelago, and the Caucasus. In California, where there are immense quantities of this material, it occurs in every variety of density, from 0·94 to 1. In consistence it varies from that of a thin sirup to that of soft mortar. It issues there from a stratum of shale of considerable thickness which occurs in the miocene sandstones of the Coast range. It oozes from springs upon hillsides, over which it trickles; it accompanies water in pools, and flows upon the surface of streams. It has been obtained from artesian borings at a depth of more than 450 ft. of the consistence of tar, and at a depth of 117 ft. so tenacious as to prevent the drill from penetrating further. In a few localities in this region the maltha is mixed with sand, the mixture forming strata or beds of great

extent. At Enniskillen the maltha forms what are known as "gum beds." Barbadoes tar was long an article of commerce, used in medicine as a liniment. The California malthas have been used to some extent as a crude material for the manufacture of kerosene; but they have not been found to possess much value for this purpose when treated in the same apparatus as is used for petroleum; when it is distilled under pressure, or "cracked," a better result is obtained both as regards yield and quality.—Little is known regarding the chemical constitution of maltha; but it is without doubt a mixture of hydrocarbons more dense than those found in petroleum. Some specimens contain nitrogen, as is proved by the fact that maggots are developed in immense numbers in pools of this substance. It is also possible that oxygen is a constituent of some varieties. While this substance is widely distributed and occurs in vast quantities in some localities, it is at present very much less valuable than petroleum. It is readily distinguished from it by its greater viscosity and its tendency to froth when heated, the froth often occupying 20 times the bulk of the maltha at the temperature of boiling water.

MALTHUS, Thomas Robert, an English political economist, born at Albury, Surrey, in 1766, died in Bath, Dec. 29, 1834. His father was a gentleman of fortune, interested in classical and philosophical studies, and so intimate a friend of Rousseau that he was appointed one of his executors; and David Hume was likewise among his friends. In 1784 he was admitted to Jesus college, Cambridge, and became one of the first classical scholars. He received his master's degree and a fellowship in 1797, entered holy orders, and divided his time between the care of a small parish in Surrey and his studies in Cambridge. In 1798 he published anonymously the first edition of his work on population, which was subsequently much enlarged and modified. The title of the sixth and last revision (1826) is: "An Essay on the Principle of Population, or a View of its past and present Effects on Human Happiness, with an Inquiry into our Prospects respecting the future Removal or Mitigation of the Evils which it occasions." His object at first was to refute the theories of Condorcet and Godwin on human perfectibility and political optimism, by showing the necessary sufferings of the poor from the tendency of population to increase faster than the means of subsistence. The condition of the poor became the prominent feature of the subsequent editions. In 1799 he visited Sweden, Norway, Finland, and Russia, collecting facts and documents in illustration of his subject; and during the interval of peace in 1802 he explored France and Switzerland. He married in 1805, and was appointed professor of history and political economy in the East India college at Haileybury, which post he held till his death. His other principal writings are: "Observations on the Effects of the Corn Laws" (3d ed., 1815); "An Inquiry into the Nature and Pro-

gress of Rent" (1815); "Principles of Political Economy" (1820); and "Definitions in Political Economy" (1827).—His reputation rests almost exclusively upon the views advanced in his work on population. He held that population, when unchecked, increases in a geometrical ratio, while food can be made to increase at furthest only in an arithmetical ratio. Powerful checks on population must be constantly in action, which may be resolved into vice, misery, and moral or prudential restraint.

MALTITZ, Apollonius von, baron, a German author, born in Königsberg in 1795, died in Weimar, March 2, 1870. He was a brother of the poet Franz Friedrich von Maltitz (1794–1857), and like several of his relatives he was employed in the diplomatic service of Russia, representing that empire at Weimar from 1841 to 1865. He published novels, poetry, dramas, tragedies, comedies, and an autobiography (1863). His best known tragedies are *Virginia* (1855), *Anna Boleyn* (1860), and *Spartacus*.—Another distinguished poet of the same family was GOTHILF AUGUST VON MALTITZ (1794–1837).

MALTZAN, Melarich Karl Eckardt Hellmuth, baron of Wartenburg and Penzlin, a German traveller, born in Dresden, Sept. 6, 1826, died in Pisa, Italy, Feb. 22, 1874. He studied at several German universities, made explorations in north Africa, Arabia, and other countries, and published *Drei Jahre im Nordwesten von Afrika* (4 vols., Leipsic, 1863; 2d ed., 1868); *Wallfahrt nach Mekka* (2 vols., 1865); *Reise auf der Insel Sardinien* (1869); *Sittenbilder aus Tunis und Algerien* (1869); *Reise in den Regenschaften Tunis und Tripolis* (3 vols., 1870); and *Reise nach Südarabien* (Brunswick, 1872). He was a high authority in Phœnician and old Egyptian archaeology, and in S. Arabian geography, ethnology, and philology.

MALUS, Étienne Louis, a French engineer and physicist, born in Paris, June 23, 1775, died there, Feb. 23, 1812. He belonged to a distinguished family, and his intellectual precocity manifested itself while he was at school in the composition of an epic poem and of two tragedies. At the same time he was proficient in mathematics, and passed a brilliant examination as a military engineer. In 1793 he received the rank of sub-lieutenant, but as the school of Mézières which had conferred it was closed, he enlisted as a volunteer, and exhibited so much talent while employed on the fortifications of Dunkirk, that he was sent as a pupil to the newly established polytechnic school, which he left in 1796 with the grade of sub-lieutenant; and next year he entered the army as captain. He distinguished himself at the capture of Malta and of Jaffa, where he narrowly escaped losing his life by the plague. He was among the earliest members of the Egyptian institute, and in 1799 he was made by Kléber chief of battalion. Shortly after his return from the East he married the daughter of Chancellor Koch,

of the German university of Giessen, whose acquaintance he had made while formerly stationed there. In 1804 he was commissioned by Napoleon to draw up plans for the enlargement of the harbor and fortifications of Antwerp, and he subsequently superintended the reconstruction of the fort at Kehl, opposite Strasburg. In 1810 he became mayor, member of the academy, and examiner at the polytechnic school, and next year provisional director of that institution. His chief publications include a mathematical *Traité d'optique*, first published in 1810, in which he promulgated some valuable discoveries respecting the refraction of light in transparent media; and the "Theory of Double Refraction" (*Mémoires présentés à l'institut*, vol. ii.), containing an account of his discoveries respecting the polarization of light, and showing that light may acquire properties identical with either of two rays yielded by refraction through Iceland spar by the process of simple reflection at a particular angle from any transparent body. This famous memoir received an academical prize at the suggestion of Laplace. He also published an "Essay on the Measurement of the Refractive Force of Opaque Bodies;" "Remarks on some new Optical Phenomena," intended to prove that two portions of light are always polarized together in opposite directions; a paper "On Phenomena accompanying Refraction and Reflection," and one "On the Axis of Refraction of Crystals."

MALVERN, Great, a town of Worcestershire, England, celebrated as a watering place, on the E. side of the Malvern hills, 8 m. S. S. W. of Worcester; pop. in 1871, 7,825. The springs, which are sulphuretted and slightly tepid, are especially beneficial in glandular and skin complaints. They are situated between Great and Little Malvern, the latter place being 4 m. S. of the former, which is surrounded by fine country residences and contains delightful walks and good accommodations for bathers and visitors. There are several schools, an excellent library and reading room, and a chapel of the countess of Huntingdon's connection. The ancient church, formerly part of a monastery founded by Edward the Confessor, is one of the finest specimens of Gothic architecture in England. The Malvern hills, which reach a height of about 1,400 ft., extend about 9 m. N. and S.

MALVERN HILL, Battle of. See CHICKAHOMINY.

MALVOISINE, or *Mavmoisine*, William de, a Scottish ecclesiastic, died July 9, 1238. He was educated and perhaps born in France, but was at an early age archdeacon of St. Andrews. In 1199 he became chancellor of Scotland, in 1200 bishop of Glasgow, and in 1202 bishop of St. Andrews, retaining the latter see until his death. In 1211, as papal legate, in concert with the bishop of Glasgow, and at the request of the pope, he convened a council of the clergy and people at Perth to urge an expedition to the Holy Land. In 1214 he officiated at the

coronation of Alexander II., and from 1215 to 1218 attended the fourth Lateran council as one of the representatives of the Scottish church. He was a zealous churchman, and, according to Fordun, was equally zealous in support of his personal rights, having deprived the abbey of Dunfermline of the presentation to two livings because its monks had once neglected to provide him with wine for supper. He introduced new monastic orders into Scotland, established many Dominican and other convents, and wrote the lives of St. Ninian and Kentigern.

MALWA, an old province of central India, comprising a table land from 1,500 to 2,500 ft. above the level of the sea, bounded N. E. by the valley of the Ganges, E. by Bundelcund, S. by the Vindhya, and W. by the Aravulli mountains, and lying chiefly between lat. 22° and 24° N., and lon. 74° and 78° E.; length about 220 m., average breadth 150 m. The people are mostly Hindoos. It is divided into a number of native states under British protection, and includes part of the possessions of Sindia and Holkar. The surface is uneven, with a gradual descent from the Vindhya mountains. It is watered by many rivers, the chief of which is the Chumbul, an affluent of the Ganges. The soil is fertile, producing cotton, tobacco, opium, indigo, sugar, and grain, and affording pasturage for large numbers of sheep and cattle. The rivers are not navigable, but a considerable overland trade is carried on in cottons, printed cloths, opium, and other products. The principal towns are Oojein, Indore, Bhopal, and Bilsa.—Malwa became tributary to the sovereign of Delhi in the 13th century, but at the beginning of the 15th threw off the yoke, and for 130 years formed a powerful independent kingdom. It was subsequently conquered by Shīr Khan, annexed to the Mogul empire by Akbar, overrun by the Mahrattas early in the 18th century, and separated from the Mogul territory about 1732. It was long desolated by the Pindarrees, who were subdued by the marquis of Hastings and Sir John Malcolm. A police force of Bheelles was subsequently organized by the British, and for some time proved highly efficient, but a large portion of it mutinied in 1857.

MAME, Alfred Henri Armand, a French printer, born in Tours, Aug. 17, 1811. In 1833 the printing establishment founded by his father in Tours came into his possession, in partnership with his cousin Charles Ernest Mame, who was mayor of Tours from 1851 to 1865. The cousins, who are also brothers-in-law, together extended the business till 1845, when it came under the sole direction of Alfred Mame, who raised it to the greatest importance. The establishment includes departments for printing, binding, and bookselling. About 700 persons are employed within and 500 without the premises. It produces daily about 20,000 volumes, bound and unbound. Among the special publications of this house are liturgical and

devotional works, small books for religious education printed under the auspices of the archbishop of Tours, editions of the classics, and elementary treatises on science and education, issued likewise under ecclesiastical authority. Its small prayer books (*Paroissiens*), bound in leather and with gilt edges, are sold at retail for 35 centimes (about 7 cents). About 1854 M. Mame entered upon the publication of richly illustrated works, among the most celebrated of which is the Bible with illustrations by Doré (1865-'6). He obtained prizes at the London exhibition of 1851, the grand medal of honor at the French exposition of 1855, and the grand prize at that of 1867. In the last year he also received one of the prizes of 10,000 francs offered to model establishments in which the greatest social harmony and comfort prevail among the workmen.

MAMELUKES (Arabic, *memalik*, a slave), a body of soldiery who ruled Egypt for several centuries. They were introduced into that country by the sultan Malek el-Adel II. about the middle of the 13th century, and were composed originally of young captives purchased from the Mongols. They were called the Bahri Mamelukes, or Mamelukes of the river, because they were trained on an island in the Nile. They formed the body guard of the sultan. Turān Shah, the son and successor of Malek el-Adel, becoming unpopular, the Mamelukes deposed and murdered him about 1250, and raised their commander Eybek to the throne. A line of sultans known as the Bahri or Turkish dynasty now followed, all of whom were raised to power by the Mamelukes, and many of them deposed and slain. A new band of Mamelukes, however, had been created by these sovereigns, composed of Circassians and Georgians, who were called Borgis, suggestive of a tower or castle, from the fact that they had been employed on fortifications in Egypt. In 1382 the Borgi Mamelukes gained the ascendancy over the Bahris, and made their commander Barkok sultan. The Borgis continued in power till 1517, when they were subdued by the Ottoman Turks, and Egypt became a dependency of Constantinople. The Turkish sultan, however, placed the 24 provinces into which he divided Egypt under Mameluke governors or beys, who served to keep the Turkish viceroy in check. The beys also had the right to elect the governor of Cairo, an official of great power. The number of the Mamelukes was about 12,000, and they were nearly all from the region between the Black sea and the Caspian, whence they were brought in their youth to Cairo, compelled or persuaded to embrace Mohammedanism, and educated as soldiers. They did not intermarry with the natives of Egypt, but bought wives of their own race from the traders in Circassian slaves. These women from the north seldom bore children in Egypt, or if they did their offspring were sickly and short-lived. Though instances of hereditary

succession among the Mamelukes were not unknown, they were comparatively rare, and it was generally from master to slave, and not from father to son. Volney, who visited Egypt in the latter part of the 18th century, asserted that all Mameluke children perished in the first or second descent. Each of the 24 beys maintained 500 or 600 followers, thoroughly armed and equipped, and forming an admirable cavalry force. Each of the Mamelukes was attended by two armed slaves who fought on foot. In 1798, when Bonaparte invaded Egypt, his army first encountered the Mamelukes while on the march from Alexandria to Cairo. "The whole plain was covered with Mamelukes," says Scott, "mounted on the finest Arabian horses, and armed with pistols, carbines, and blunderbusses of the best English workmanship, their plumed turbans waving in the air, and their rich dresses and arms glittering in the sun. Entertaining a high contempt for the French force, as consisting almost entirely of infantry, this splendid barbaric chivalry watched every opportunity for charging them, nor did a single straggler escape the unrelenting edge of their sabres. Their charge was almost as swift as the wind, and as their severe bits enabled them to halt or wheel their horses at full gallop, their retreat was as rapid as their advance. Even the practised veterans of Italy were at first embarrassed by this new mode of fighting, and lost several men; especially when fatigue caused any one to fall out of the ranks, in which case his fate became certain. But they were soon reconciled to fighting the Mamelukes, when they discovered that each of these horsemen carried about him his fortune, and that it not uncommonly amounted to considerable sums in gold." At the battle of the Pyramids, July 21, 1798, the Mamelukes mustered their full force, consisting of 7,000 men under Murad Bey, and attacked the French with desperate courage; but they were repulsed with terrible slaughter, and about 2,500 of them who survived fled to Upper Egypt. "Could I have united the Mameluke horse to the French infantry," said Napoleon, "I would have reckoned myself master of the world." After the French were driven from Egypt by the British, the Mamelukes regained in some degree their power, and a civil war broke out between them and the Turks. They were twice victims of treacherous massacres, and were completely crushed March 1, 1811, when Mehemet Ali beguiled 470 chiefs into the citadel of Cairo, and then closed the gates and ordered his Albanian soldiers to fire upon them. Only one escaped, a bey who leaped his horse from the ramparts and alighted uninjured, though the animal was killed by the fall. Immediately afterward a general massacre of the Mamelukes in every province of Egypt was ordered. The few who escaped fled to Nubia, and especially to the province of Sennaar, where they built the town of New Dongola and attempted to keep up their force

by disciplining negroes in their peculiar tactics. They did not succeed, however, and a few years later their number was reduced to about 100, when they dispersed, and the Mamelukes ceased to exist.

MAMERTINES. See MESSINA.

MAMIANI, Terenzio della Rovere, count, an Italian philosopher, born in Pesaro about 1800. He received a superior education, and in 1831 took part in the revolutionary movement in the Romagna, and was proscribed. He took refuge in Paris, where he was occupied in literary labors until he was permitted to return to Italy by the amnesty granted in 1846 by Pius IX. He became prominent among the liberal statesmen who gathered around the pope, and accepted a place in the administration. The vacillating policy of Pius IX., however, soon led to his retirement, and he went to Turin, where with Gioberti and others he founded a patriotic society, of which he became president. In November, 1848, after the flight of the pope to Gaëta, he returned to Rome and became minister of foreign affairs; but he soon retired in consequence of the predominance of the ultra-republican element, and also resigned his seat in the constituent assembly. After the restoration of the papal power in 1849 he went to Piedmont, and subsequently became professor of philosophy in the Turin university, and a member of parliament. He warmly supported the policy of Cavour, and in 1860 was appointed minister of public instruction. From 1861 to 1865 he was minister at Athens. In 1866 he was accredited to Switzerland, but soon afterward became a member of the Italian senate. In 1870 he was restored to the chair of the philosophy of history in the Sapienza college at Rome, which he had formerly held. He is prominent among Italian ontologists. In his earliest philosophical work, *Del rinnovamento dell' antica filosofia italiana* (1834), he adhered to the doctrine of empiricism based on psychological investigation. But he soon became a convert to Rosmini's opinion that the experimental method alone cannot philosophically reconstruct the science of nature and mind; and in his *Discorso sull' ontologia e sul metodo* (1841), and *Dialoghi di scienza prima* (1846), he strove to find a philosophical basis in common sense, and expressed for the first time his doctrine of immediate perception as the only foundation of a full insight into reality. This last phase of his doctrine is expounded in his *Confessioni di un metafisico* (1865), which is divided into two parts, respectively relating to ontology and cosmology. —A complete edition of his poetical works was published by M. Lemonnier (Florence, 1857). An English translation of his *Principii della filosofia del diritto* ("Rights of Nations"), edited by Roger Acton, was published in London in 1860. Among his later works are: *Rinascimento cattolico* (1862); *Saggi di filosofia civile* (1865); *Meditazioni cartesiane*

(1868); and *Teoria della religione e dello stato, e dei suoi rapporti speciali con Roma e colle nazioni cattoliche* (1868). He also contributes largely to the philosophical review *La Filosofia delle Scuole italiane*.

MAMMALIA, the highest vertebrate animals, including man, warm-blooded, breathing by lungs separated from the abdominal cavity by a diaphragm, generally covered with hair, and bringing forth their young alive, which they nourish by the secretion of mammary glands (whence their name). Most mammals are commonly known as quadrupeds, from their having four feet suited for progression on a solid surface; but the terms are not synonymous, as most reptiles are four-footed, and the whales cannot be called quadrupeds. The form of mammals is very various; among them we see man walking erect, the flying bats, the swimming cetaceans, the bulky elephant, the slow-moving sloth, and the agile squirrel; yet the three regions of head, neck, and trunk can always be recognized in the skeleton, and generally in the living animal. The neck, though varying in length from that of man (one seventh of the spinal column) to that of the giraffe (three sevenths), with two or three exceptions, consists of 7 vertebrae; some of the sloths have 8 or 9, and some manatees are said to have 6 only; in the hoofed animals the length of the neck depends on that of the fore legs, for the purpose of grazing; but the elephant has a long proboscis to compensate for the shortness of the neck rendered necessary by the ponderous head; the extra vertebrae of the sloths are by some considered as dorsals with rudimentary ribs to give additional mobility to the neck. The number of dorsal vertebrae varies from 11 in some of the bats to 22 in some of the sloths, man having 12; the lumbar vertebrae, 5 in man, are 2 in the ornithorhynchus and 9 in some lemurs, stronger than the dorsals, and without ribs, which are replaced by long transverse processes; the sacral vertebrae, usually 4, vary from 1 to 9; the rudimentary tail of man, the *os coccygis*, consists of 4 bones, but in the long-tailed manis there are 46 caudal vertebrae. The skull is articulated to the spine by two occipital condyles, which permit the upward and downward motions of the head, the lateral and rotating movements depending on the articulation between the first and second vertebrae; in whales the short neck is immovable as in fishes, and its bones are very thin and more or less consolidated together; the strong *ligamentum nucha*, which supports the head, is attached to the spinous processes and skull. The caudal vertebrae are of two kinds, one having a spinal canal, the other not, and the processes are always developed in accordance with the use made of the tail; in most mammals its movements are confined to brushing away insects from the skin, but in the kangaroo it forms with the hind legs a firm tripod from which the animal springs, and in some South American monkeys

it is prehensile and used as a fifth hand in hanging from trees; in the whales it becomes a powerful swimming organ, is provided on its under surface with V-shaped bones for the protection of the blood vessels, and, being horizontal, is used principally as an organ by which to rise to the surface to breathe; in the beaver the transverse processes and the lower spinous are very large for the attachment of the muscles, which move the tail like a trowel chiefly in a downward direction. The bones of the spine are united by elastic fibro-cartilages; these, in whales, form osseous disks, separating on maceration, and frequently used by arctic travellers for plates.—As all mammals breathe air, the mechanism of their respiration depends on the movable ribs and the diaphragm; man has 7 true and 5 false ribs, the former united to the sternum, the latter not; the number is in proportion to that of the dorsal vertebrae; in the whale, of 12 ribs, 11 are false, in the unau 11 out of 23, in the horse 8 out of 18, in the cats 4 out of 13, and in the manatee 14 out of 16; in the carnivora they are dense and narrow, in the herbivora large, broad, and thick. The breast bone varies in shape according to the presence or absence of clavicles; in non-clavicated mammals the chest is compressed laterally, and the breast bone has a projecting keel as in birds; in bats it is much keeled, in the higher apes flat as in man, and in the moles it extends in front of the ribs, forming a distinct piece; in mammals with clavicles the chest approaches very nearly to that of man; the human chest, however, is the only one in which the transverse exceeds the antero-posterior diameter, causing the greater separation of the shoulders and the increased facility of movement of the arms. The anterior ribs always extend as far as the breast bone, and are thus true ribs, differing in this respect from those of birds. Each of the ribs is usually connected by its head to an articular cavity formed by the bodies of two vertebrae, and by its tubercle to the transverse process of the posterior of the two; in the monotremata they are connected with the body alone, and in cetaceans often only with the transverse processes. The breast bone consists of several pieces, one behind the other, to which the anterior or true ribs are joined by cartilages which rarely become ossified; the posterior are the false or floating ribs, and are not attached immediately to the breast bone; this arrangement gives mobility to the chest and allows the elevation and depression of the ribs during respiration. The bones of the skull and face are immovably connected with each other, a character which does not occur in any of the lower classes; the brain cavity is larger than in birds and reptiles; the occipital condyles, near the centre of the base in man, are gradually removed to the posterior portion as we descend in the scale; the number of cranial bones, eight in man, is less than in most lower vertebrates. For the general characters see COMPARATIVE ANATOMY,

where also are given sufficient details on the organs of sense, teeth, digestive system, and hairy covering. The lower jaw consists of two pieces, and is alone movable; in man it is susceptible of motion up and down, laterally, and from before backward; in the carnivora the first movement, in the ruminants the second, and in the rodents the third, is specially provided for by the shape of the condyles and the form of the glenoid cavity.—The limbs of mammals vary exceedingly in shape, according to the offices to be performed by them; we find the hand of man with its thumb opposable to the fingers, the four hands of the monkey, the paddles of the whale, the walking feet of the horse, the wing of the bat, the paw of the lion, the shovel of the mole, all constructed on the same type and modified from the same bony elements. The anterior limbs are always present, with a well developed scapular arch, usually kept in place by a clavicle; this last is present in man, monkeys, the insectivora, squirrels, and bats, but absent in cetaceans, the hoofed animals, and some edentates; in most carnivora and in some rodents it is imperfectly developed; it corresponds to the furcular bone in birds, and the monotremata have in addition the second or coracoid clavicle of birds. The shoulder blade is thin, flat, and more or less triangular, generally with a well marked spine; it is long and narrow in herbivora, and placed perpendicularly on the anterior and lateral portion of the chest; in carnivora and rodents, requiring more freedom of motion, it is oblique, and so of course is the glenoid cavity; jockeys are well aware that an upright shoulder is the mark of a stumbling horse. The arm bone is nearly straight in man, much bent in the carnivora, long in monkeys and sloths, and short in ruminants and cetaceans; it is connected by a ball and socket joint with the scapula; below it articulates with the radius and ulna of the forearm by a hinge joint. The ulna is the longest in man and lies on the inside, and receives the arm bone in a deep sigmoid cavity; the radius is connected with the wrist, and turns with the movements of the hand, rolling around and upon the ulna; this independence of movement becomes less and less, according as the limbs are more used as instruments of progression; in the carnivora and rodents the two bones are distinct, but the rotation is very imperfect, and in the hoofed animals generally the two make a single bone; the radius seems to form the principal bone, the ulna being frequently, as in the horse and bats, very rudimentary. The wrist in man consists of eight bones in two rows, in other mammals varying from five to eleven; to these are attached the five parallel metacarpal bones in man, followed by the five fingers, each having three joints, except the first or thumb, which has only two; in the ruminants the two metacarpals form the single cannon bone, sometimes with rudimentary bones on the side, as the splint bones of the horse; most pachyderms have three

metacarpals, the elephant having five. In animals which walk on the ends of the toes, the metacarpus is so lengthened that it has been mistaken for the forearm, and supposed therefore to be flexed in an opposite direction to that of man; but the lower part of the fore leg of a horse, for instance, is in reality the metacarpus, and the part called the knee is the wrist joint. The fingers vary from one to five; the third or middle finger is the most constant, and commonly the longest, and is the only one found in the horse; the thumb disappears first, then the little finger, and then the fourth finger; ruminants have the second and third, or fore and middle fingers. The hind limbs are more firmly connected to the trunk than the anterior; the supporting arch is the pelvis, composed of the ilium, ischium, and pubis on each side, the first joining the sacrum, the second forming the prominences upon which man sits, and the third uniting in front; in cetaceans there is only a rudiment of this bony arch, and the hind limbs are absent. The thigh bone, the longest in man, is in most other mammals relatively shorter; it is attached by a ball and socket joint to the pelvis, in man its axis being nearly that of the body, but in the lower mammals bending more and more forward until it forms an acute angle with the trunk. The tibia and fibula correspond to the radius and ulna of the forearm, and have the patella or knee-pan in front of the articulation with the thigh bone; these are coalesced in various animals somewhat as are the radius and ulna; the tarsal bones correspond to the carpal, and are followed in the same manner by the metatarsus and toes. In the apes the great toe is opposable to the others, like the thumb, whence they are called *quadrumanæ*, four-handed; while man rests his whole foot, from the heel to the toes, on the ground, other mammals walk chiefly on the toes; the horse stands on the tips of the middle fingers and toes, the heel being nearly as high up as the knee in man, the cat on the last two joints of several toes, and the bear on the metatarsus and toes; there is no animal, except man, that can be properly said to touch the ground with the entire foot; in the seals all the bones of the leg and foot may be recognized, but they are united by a membranous web into a kind of caudal fin. The bones of mammals have not the air cells found in birds, but are either solid or their cavities are filled with an oily matter called marrow; there are, however, air cavities called sinuses, especially large in the frontal bone of ruminants, as in the ox and sheep, and greatly developed in the frontal region of the elephant; these communicate either with the nasal or auditory passages.—While most mammals resemble man in the arrangement of the muscles, others approach birds and even fishes in this respect; as they are less active than birds, their muscles are less firm and the tendons less liable to ossify; they are generally fewer in number than in man, and their variations from the human type are

noticed chiefly in the limbs; in the mole, for instance, the flexors of the arm, the great pectoral, and the *latissimus dorsi* are very large; the herbivora and pachyderms require massive muscles, and the agile carnivora compact and energetic ones; the muscles of the ears are specially developed in the herbivora, and those of the nose in the hog; the *gluteus maximus*, the largest of all in man, is much smaller in the monkeys, and very small in the lower mammals; the nates in the horse are composed principally of the *gluteus medius*; the muscles of the calf, so characteristic of man, are small in all below him, and the short muscles of the human hand are absent in the lower mammals; those of the wings in bats are arranged somewhat as in birds, and those of cetaceans as in fishes. A muscle remarkably developed in many mammals, but rudimentary in man, is the cutaneous layer, the *panniculus carnosus*, of which the human analogue is the *platysma myoides* of the sides of the neck and face; we notice its action in the horse when a fly or any irritating object touches the skin; in the erection of the quills of the porcupine, and in the coiling of the body of the armadillo and hedgehog. The minute coccygeal muscles of man are represented by numerous and powerful ones in the prehensile tail of certain monkeys, in the strong trowel of the beaver, and in the fluke of the whale, analogous to the human *multifidus spinæ*.—In man and mammals the heart is composed of two distinct halves, each divided into two cavities, an auricle and a ventricle; the course of the blood is from the left ventricle to the aorta and over the body, pure arterial; then traversing the systemic capillaries it enters into the veins, and is carried to the right auricle; thence it passes to the right ventricle, and thence by the pulmonary artery to the lungs, in whose capillaries it becomes purified by the oxygen of the respired air, and is returned by the pulmonary veins to the left auricle, whence it enters the left ventricle to be distributed as before. Here, therefore, the blood passes twice through the heart and through two systems of capillaries before completing its circle; hence the circulation is called double, and it is also complete, as the whole mass of the blood is purified in the lungs before it is sent over the body. Before birth, when the lungs are impervious, the auricles communicate directly, and one or more vessels pass from the right ventricle to the aorta, conveying the blood over the body without sending it to the lungs; but when respiration begins these communications between the arterial and venous systems are closed. In the dugong the two ventricles are separated by a deep cleft; in some mammals the right auricle receives three venæ cavae; the apex is not inclined to the left, as in man, except in some monkeys, and in some hoofed animals two small flat bones are imbedded in the substance of the left ventricle. In cetaceans there is a plexiform arrangement of the arte-

ries of the walls of the chest, allowing an accumulation of blood in them, to be used as required during prolonged submersion; in many ruminants the internal carotid forms a *rete mirabile*, or network of vessels, at the entrance of the skull, doubtless to prevent injury to the brain from too great force of the blood while the head is in a dependent position; in the slow-moving sloths the arteries of the limbs communicate very freely, rendering compression during their climbing impossible except in a few vessels at a time. A similar disposition prevails in the venous system; in the seal and otter, as in the ducks, the inferior cava is dilated into a receptacle which holds the blood while they are under water, and only permits it to pass on to the lungs when they come to the surface; in the porpoise tortuous sinuses receive the intercostal veins, and in the foot of the horse a fine network is distributed on the front of the coffin bone. The heart is composed of muscular fibres, each cavity having its own, arranged in a spiral manner from the point to the base; the course of the blood is directed from the auricles to the ventricles by the mitral valve on the left side and the tricuspid on the right, kept in place by tendinous cords attached to fleshy columns, and the entrances of the aorta and pulmonary artery are guarded each by three semilunar valves which prevent regurgitation. The lungs of mammals are almost always in pairs, and hang freely in the chest suspended by the straight windpipe, and enclosed within the serous cavity lined by the pleura; the air tubes are distributed to all their parts, and the pulmonary cells are minutely subdivided and do not communicate with any other air cells in the body as they do in birds. The windpipe varies much in length, in the number of its rings (which are from 14 to 78), and in their completeness; the cartilages do not generally form a complete circle, being membranous posteriorly, and in the whales the membranous portion is said to be in front. The mechanism of the mammalian respiration has been described under DIAPHRAGM, the muscular partition which separates the thoracic and abdominal cavities in this class.—The voice, under the control of the will, is produced by the passage of air from the lungs over certain organs in the larynx or upper portion of the windpipe; in man the larynx is a short and wide tube, suspended as it were from the hyoid bone, formed of cartilaginous plates, called the thyroid, cricoid, and two arytenoid cartilages; the prominence commonly called "Adam's apple" is the anterior surface of the thyroid cartilage. The mucous membrane forms two lateral folds from before backward, like the lips of a buttonhole, the vocal cords or ligaments; above these are two other folds, between which and the vocal cords is a cavity on each side, the ventricle of the larynx; the space between these four folds is the glottis, which is covered above, during the passage of food or drink, by a fibro-cartilaginous tongue,

the epiglottis. In ordinary respiration the air passes noiselessly; but when the will contracts or otherwise modifies these cords, sound is produced, which in man becomes articulate speech by the action of the pharynx, nasal passages, and parts contained within the mouth. The epiglottis exists in all mammals, but it is sometimes divided at the upper end; in cetaceans, the larynx ascends to the posterior nares and communicates with the blow-hole on the top of the head. The lion's roar depends on the great size of the larynx; the grunt of the hog is produced in cavities communicating with its ventricles; the neigh of the horse by vibration of folds connected with the vocal cords; the bray of the ass by reverberation in a large cavity with small aperture under the thyroid cartilage; in the howling monkeys the hyoid bone is dilated into a bony pouch, and each ventricle opens into a large membranous sac, in which the loud sounds of these animals are produced; in the marsupials the voice is very weak.—The urinary system of mammals consists of secretory organs (the kidneys), and a reservoir for the secreted fluid (the bladder), communicating with the former by the ureters and externally by the urethra. The kidneys of mammals present the same external cortical and internal tubular portions as in man, and also the suprarenal capsules, in the lumbar region near the vertebra and external to the peritoneal sac; they differ somewhat in form, being more or less lobulated, as in the human foetus, in cetaceans, seals, otters, bears, the elephant, and ox; the lobules vary from 10 in the otter to 130 in the seals, in cetaceans resembling a bunch of grapes; in all, except the monotremata, the ureters open into the bladder; in these into the urethra, as in chelonians. The bladder is generally more loosely connected in other mammals than in man; it is largest in the herbivora, smaller and more muscular in the carnivora and rodents. The chemical composition of the urine is about the same in carnivora as in man, except in the absence of uric acid; in the herbivora it is alkaline, containing hippuric acid and much earthy carbonate. In the stags, below the inner angle of the eyes, there is an opening communicating with a large membranous pouch, from the glands of which is secreted a brownish liquid, flowing down the sides of the face, like tears; many animals have glands on the abdomen, in the groins, or about the genito-anal openings, whose secretion is very odorous, as in the musk deer, beaver, civet, and skunk.—The special internal male organs are the testes, which secrete the sperm, with certain accessory glands (as the prostate and Cowper's), and seminal receptacles or *vesiculae*; in the female the germs are formed in the ovaries, whence they escape through the Fallopian tubes into the uterus, and thence when full-grown externally; as the name mammal imports, they have also external glands for the secretion of milk, the

mammæ or breasts. The testes may be permanently external, as in the dog; always abdominal, as in the seal, elephant, and cetaceans; or external during the rutting season, and at other times internal, as in the mole and porcupine. The epididymis is usually largely developed; the seminal vesicles are found in monkeys, bats, rodents, and pachyderms, but are wanting in carnivora, most plantigrades, ruminants, and marsupials; the prostate gland exists in some form in all mammals; the absence of Cowper's glands in most pachyderms, rodents, and carnivora shows that their action is not essential to reproduction. The human ovaries are two oval, glandular bodies, about an inch long, in the posterior portion of the broad ligaments; each contains about 20 Graafian vesicles, enclosing an ovum. All the internal organs, except the uterus, are much alike in the other mammalia. This last organ, single in the monkeys, is in carnivora, many rodents, pachyderms, ruminants, and cetaceans, generally divided at the base into two horns (*cornua*), each sometimes having its distinct opening; in marsupials the ovaries are more or less racemose, as in birds. In most mammals, after the fecundated ovum has descended through the Fallopian tube (in the higher orders about the 12th day), an intimate vascular connection takes place between the sinuses of the parent and the chorion of the foetus, forming the placenta, which continues to supply the young with nutriment until it is capable of an independent existence. The period of utero-gestation, about 270 days in the human mammal, varies in the different families. This group of placental mammals has been called monodelphians to distinguish them from the didelphians, which include the marsupials and monotremata; the former have a more perfect brain, with its hemispheres united by a *corpus callosum*; the latter bring forth their young in a very imperfect condition, but have the brain destitute of a *corpus callosum*, the abdominal walls supported in front by two bones arising from the pubis, and an external pouch for the reception of the young. Prof. Jeffries Wyman ("Proceedings of the Boston Society of Natural History," vol. vi., p. 363), from the examination of a large number of foetal pigs, has shown that the above division of mammals into "placentals" and "implacentals" is not well defined; he found that in pigs there is, strictly speaking, no placenta, the maternal and foetal vessels being in relation only by means of very minute diffused villi and slight foldings of the chorion; this condition is intermediate between those of marsupials and ruminants, and shows such a gradual transition in this respect that the former must be brought nearer than has been usually admitted to ordinary mammalia. Mammary glands exist in both sexes, but serve for purposes of lactation only in the female; the number is generally in relation with the number of the young at a birth; there are 2 in monkeys,

the elephant, the goat, and the horse; 4 in the cow, the stag, and the lion; 8 in the cat; 10 in the hog, rabbit, and rat; and 12 or 14 in the agouti. The position also varies; in monkeys and bats they are on the chest, in most carnivora on the chest and abdomen, and in the ruminants far back between the posterior limbs; in marsupials they are concealed within the abdominal pouch. Some mammals are born with the eyes open, and are at once able to run in search of food; many, however, are born with the eyes closed and in a very weak condition; and a few, as the marsupials, leave the uterus in such an imperfect state that they would perish did not the parent place them in her pouch, where they complete their development, each suspended to a teat. In the monotremata (*ornithorhynchus*, &c.), which seem to form the connecting link between the mammals and birds, in addition to the horny bill, cloaca, and bird-like ovaries, there are the form, external covering, skeleton, and milk-secreting glands of the mammals.—As to physical distribution, some mammals dwell entirely in the sea, as the cetaceans and most seals; some of the latter and the sirenoid pachyderms (manatee, &c.), live chiefly in fresh water; others, beavers, muskrats, the *ornithorhynchus*, &c., frequent rivers and lakes; but most live upon the land, some on mountains like the chamois and ibex, some on plains like the antelopes and bison, some on trees like the apes, squirrels, and sloths; others sail or fly in the air like the flying lemur and the bats, and others live under ground like the moles. For these different methods of progression and habits of life, the limbs are variously adapted by modifications of the same few osseous elements, and the study of fossil mammals develops the same order in past geological ages. The study of the geographical distribution of mammals shows that the number of genera and species increases from the poles to the equator, with the exception of the whales and seals, which are most numerous in the polar regions; within the northern arctic circle there are species common to both hemispheres, as the arctic fox, white bear, reindeer, and ermine; in temperate North America the species are different from those of the eastern hemisphere, and in South America even the genera from those of the old world, as those including the peccary, llama, armadillo, ant-eater, sloth, cavy, agouti, vampire bat, marmoset, the howling and prehensile-tailed monkeys; the raccoon and muskrat are exclusively American; the hog, horse, camel, rhinoceros, elephant, lion, tiger, lemur, and anthropoid apes belong now to the eastern world; the giraffe, hippopotamus, chimpanzee, and most of the antelopes, are African; all the marsupials (except the American opossums) and the monotremata are Australian, while the stags, squirrels, cats, bears, dogs, and bats are absent from this region. The marsupials, though forming scarcely one fifteenth of the land mammals in the world,

constitute three fourths of the mammalian fauna of Australia; exclusive of cetaceans and seals, the rodents form one third of the entire number of species of the world, the bats and carnivora one third, the remaining third being chiefly the monkeys, ruminants, marsupials, and insectivora, according to Van der Hoeven; in Europe, wanting marsupials and monkeys, the rodents are one third, bats one sixth, and insectivora about one thirteenth; in North America the species of rodents form perhaps half the entire number of land mammals; the large pachyderms, edentates, and the apes belong to the warm regions, most of the latter being African; the insectivora are almost peculiar to the northern hemisphere, and the lemurs are most common in the southern. Excepting the whales and bats, mammals do not migrate, but spend the summer and winter in the same locality; the whales pass the summer in the polar regions, and come southward in winter into the lower Atlantic. The phenomena of hibernation or winter-sleep in mammals have been described under the former title.—MAMMALOGY includes the classification of mammalia. The mammalia were first separated from other four-footed animals by Aristotle, who called them *zootoca* or viviparous animals; he divided them into three sections according to their locomotive organs: 1, *dipoda*, or bipeds; 2, *tetrapoda*, or quadrupeds; 3, *apoda*, impeds or whales. The quadrupeds, including all but man and the cetaceans, he subdivided into two great groups according to the modifications of the organs of touch, in the first of which the ends of the digits are left free for the sense of feeling, the nail being on the upper surface only, and in the second the feet ending in hoofs, corresponding respectively to the *unguiculata* and *ungulata* of Ray. The *unguiculata* he divided by the teeth into three families: 1, those with cutting incisors and triturating or flattened molars, like the apes (*pithecoida*) and the bats (*dermaptera*); 2, those with canine or carnivorous teeth, *carcharodonta* or *gampsonucha*; 3, those corresponding to the rodents, with the negative character of the absence of canine teeth. The *ungulata* or hooved quadrupeds he divided, according to the organs of motion, into: 1, *polyschida* or multungulates, like the elephant; 2, *dischida* or bisulcates, including the ruminants (*merycizonta*) and the hogs; and 3, *aschida*, or solidungulates, like the horse. The apodal quadrupeds included the cetaceans or *cetoda*. It thus appears that Aristotle clearly perceived the principles upon which mammals are classified by the best modern naturalists.—This arrangement was not improved upon until John Ray published his *Synopsis* in 1693 in London, and his improvements relate to the four-footed mammals. In his *ungulata* quadrupeds he places the solipedous (as the horse), the bisulcate ruminants (like the ox and stag) or non-ruminants (as the hog), and the quadrisulcate (rhinoceros and hippopotamus); in the un-

guiculate the feet are either bifid (as in the camel), or multifid with digits adhering together (as in the elephant), with distinct depressed digits (as in apes), or compressed (as in carnivora, insectivora, rodents, and edentates).

—Linnæus founded his primary divisions on the locomotive organs, deriving his orders from the modifications of the teeth; in his earlier editions of the *Systema Naturæ*, up to the 10th, he called the class *quadrupedia*, including the cetaceans among fishes; in his 12th edition (1766) he makes seven orders, as follows: A. *Unguiculata*: I., *primates*, with four front cutting teeth, including man, the monkeys, and bats (4 genera); II., *bruta*, with no front teeth in either jaw, including the elephant, walrus, and edentates (6 genera); III., *feræ*, with front teeth, conical and long canines, including the carnivora, opossum, and insectivora (10 genera); IV., *glires*, with two front cutting teeth in each jaw, including the rodents (6 genera). B. *Ungulata*: V., *pecora*, with cutting front teeth in the lower jaw, but none in the upper, including the ruminants (6 genera); VI., *belluæ*, with obtuse front teeth in both jaws, including the pachyderms generally (4 genera). C. *Mutica*: VII., *cete*, with horny or bony teeth, pectoral fins instead of feet, and horizontal flattened tail, including the cetaceans (4 genera). He thus made 40 genera in all. Linnæus followed Ray in placing the elephant among the *unguiculata*, an error avoided by Aristotle. In 1798 Cuvier published his *Tableau élémentaire des animaux*, in which he laid down the basis of his classification, which was variously modified until the second edition of his *Règne animal* in 1829; in that work he makes the nine following orders of mammalia: *binana*, *quadrumana*, *carnivora*, *marsupialia*, *rodentia*, *edentata*, *pachydermata*, *ruminantia*, and *cetacea*. In his first edition the marsupials were ranked among carnivora, and in the *Tableau élémentaire* there were three grand divisions: I., *unguiculata*, with the orders *binana*, *quadrumana*, *cheiroptera*, *plantigrada*, *carnivora*, *pedimana*, *rodentia*, *edentata*, and *tardigrada*; II., *ungulata*, with the orders *pachydermata*, *ruminantia*, and *solipeda*; and III., *mutica*, with the orders *amphibia* and *cetacea*.

—The systems of Blumenbach, Illiger, and Desmarest differ little from that of Cuvier, except in the names of the orders and their subdivisions. De Blainville (1822) makes in the type *osteozoaria*, or vertebrates, the sub-type *eivipara* and the class *pilifera* or *mammifera*, with the divisions *monadelphya* and *didelphyia*. Temminck (1827) makes the 11 orders of man, monkeys, bats, carnivora, marsupials, rodents, edentates, pachyderms, ruminants, cetaceans, and monotremata. Fischer, in his *Synopsis Mammalium* (1829), makes the nine orders of *primates* (man and monkeys), *cheiroptera* (bats), *feræ* (carnivora), *bestiæ* (insectivora and marsupials), *glires* (rodents), *bruta* (edentates and monotremata), *belluæ* (pachyderms and

solipeds), *pecora* (ruminants), and *cete* (herbivorous and ordinary cetaceans).—McLeay (1821), the founder of the quinary classification, makes five orders of mammals, which may be arranged in a tabular form as follows:

Mammals.	Characters.	Birds.
1. <i>Feræ</i> .	Carnivorous.	<i>Raptores.</i>
2. <i>Primates.</i>	Omnivorous.	<i>Insectores.</i>
3. <i>Glires.</i>	Frugivorous.	<i>Rasores.</i>
4. <i>Ungulata.</i>	Frequenting the vicinity of water.	<i>Grallatores.</i>
5. <i>Cetacea.</i>	Aquatic.	<i>Natatores.</i>

This shows the analogies between mammals and birds, in regard to food and habits, which were afterward modified by Swainson (1835) as follows: I., typical group, *quadrumana*, organized for grasping, analogous to insessorial birds; II., sub-typical, *feræ*, with retractile claws and carnivorous, to the *raptores*; III., aberrant group, including *cetacea*, eminently aquatic, with very short feet, to *natatores*; *glires*, with lengthened and pointed muzzle, to *grallatores*; and *ungulata*, with crests on the head, to *rasores*.—Oken in 1802 divided animals into five classes according to the organs of sense; this view is elaborated in his "Physiophilosophy" (Ray society edition, 1847); of these five classes the fifth and highest is the *ophthalmozoa* or mammalia, so called because in them the eyes are movable and covered with two perfect lids, the other sense organs having however suffered no degradation; he also calls them *thricozoa* or pilose animals on account of their hairy covering, and æsthetic or sensorial animals from the completion and combination of all the organs of sense. They belong to his province of *sarcozoa* or flesh animals. His divisions are as follows: A. *Splanchno-thricozoa*: order I., rodents; II., edentates and marsupials; III., insectivora and cheiroptera. B. *Sarco-thricozoa*: IV., *ungulata*. C. *Æsthesio-thricozoa*: V., *unguiculata*. Every family of the *thricozoa* contains five genera, in accordance with the five organs of sense; the human family or genus has also five varieties on the same principle: 1, the skin man, the black African; 2, the tongue man, the brown Australian and Malay; 3, the nose man, the red American; 4, the ear man, the yellow Mongolian; and 5, the eye man, the white European.—Another philosophical system is that of Carus. The mammalia are made the seventh class of his third circle, the *cephaloza*. He makes ten orders, as follows: 1, *natantia*, or herbivorous and carnivorous cetaceans, with evident relations with fishes; 2, *reptantia*, or monotremata and edentates, related to reptiles; 3, *volitantia*, bats and flying lemurs, related to birds; 4, *mergentia*, seals and walrus, a repetition of the first; 5, *marsupialia*, a repetition of the second; 6, *glires* or rodents, a repetition of the third; 7, *pachydermata*, a second repetition of the first; 8, *ruminantia*, a second repetition of the second, indicated by the fifth, which is half ruminant; 9, *feræ*,

a second repetition of the third; and 10, *quadrumana*, having relations with man.—The fundamental idea of the classification of Fitzinger (1843) is the same as that of Oken, the class mammalia having five series, according to the development of the organs of sense, and each series three orders, viz.:

TOUCH.	TASTE.	SMELL.
<i>Cetacea.</i>	<i>Pachydermata.</i>	<i>Edentata.</i>
1. <i>Balanodea.</i>	1. <i>Phocina.</i>	1. <i>Monotremata.</i>
2. <i>Delphinodea.</i>	2. <i>Obesa.</i>	2. <i>Lipodonta.</i>
3. <i>Sirenia.</i>	3. <i>Ruminantia.</i>	3. <i>Tardigrada.</i>
HEARING.	VISION.	
<i>Ungiculata.</i>	<i>Primates.</i>	
1. <i>Glires.</i>	1. <i>Chiropteri.</i>	
2. <i>Bruta.</i>	2. <i>Hemipitheci.</i>	
3. <i>Feræ.</i>	3. <i>Anthropomorphi.</i>	

—Of the embryological systems of classification may be mentioned those of Von Baer, Van Beneden, and Vogt. Von Baer (1828) proposed the following divisions of this class of his doubly symmetrical or vertebrate type, with osseous skeleton, lungs, an allantois, and an umbilical cord: the cord may disappear early, 1, without connection with the mother (*monotremata*), or 2, after a short connection with the mother (*marsupialia*); or the cord may be longer persistent, 1, the yolk sac continuing to grow for a long time, the allantois growing little (*rodentia*), moderately (*insectivora*), or much (*carnivora*), or 2, the yolk sac increasing slightly, the allantois growing little and the umbilical cord very long (monkeys and man), continuing to grow for a long time and the placenta in simple masses (ruminants), or growing for a long time and the placenta spreading (pachyderms and cetaceans). According to Vogt (1851), mammals may be arranged in two divisions: I., *aplacentaria*, with the orders *monotremata* and *marsupialia*; and II., *placentaria*, with series 1, composed of the orders *cetacea*, *pachydermata*, *solidungula*, *ruminantia*, and *edentata*; series 2, of the orders *pinnipedia* and *carnivora*; and series 3, of the orders *insectivora*, *volitantia*, *glires*, *quadrumana*, and *bimana*. Van Beneden (1855), in the class mammalia of his *hypocotyledones* or hypovittellians (vertebrates), in which the vitellus or yolk enters the body from the ventral side, establishes the ten orders *primates*, *chiroptera*, *insectivora*, *rodentia*, *carnivora*, *edentata*, *proboscidea*, *ungulata*, *sirenoidea*, and *cetacea*. Prof. Baird (in vol. viii. of the "Pacific Railroad Survey," 1857) adopts the following arrangement: A, *ungiculata*, with the orders: 1, *quadrumana*; 2, *chiroptera*; 3, *rapacia*; 4, *marsupialia*; 5, *rodentia*; and 6, *edentata*;—B, *ungulata*, with orders: 7, *solidungula*; 8, *pachydermata*; and 9, *ruminantia*;—C, *pinnata*, with orders: 10, *pinnipedia*; and 11, *cetacea*. All of these, except the first, are found in North America; the horse, though not now existing native, was formerly an inhabitant of this country. Agassiz, in his essay on classification (1857), makes mammals the eighth class

of vertebrates, with only the three orders of *marsupialia*, *herbivora*, and *carnivora*.—Owen (in the article "Mammalia" in the "Cyclopædia of Anatomy and Physiology," 1847) admits in the sub-class of *placentalia* the ten orders of *bimana*, *quadrumana*, *chiroptera*, *insectivora*, *carnivora*, *cetacea*, *pachydermata*, *ruminantia*, *edentata*, and *rodentia*, and in the sub-class *implacentalia* the orders *marsupialia* and *monotremata*; the monkeys by the *galeopithecus* are connected with the *chiroptera*, and by the lemurs with the *carnivora*; the last by *otaria* are related to *cetacea*, which in turn have certain affinities with the fishes; the rodents are connected with ruminants by the musk deer; the *monotremata* lead to reptiles.—Before introducing the more recent classification of mammals by Prof. Owen, according to the cerebral system, the reader should be reminded that until the time of Cuvier the principal subdivisions were based upon the Aristotelian characters derived from the organs of locomotion, the secondary groups being established on the peculiarities of the dental system; Cuvier added others drawn from the osseous and generative systems; De Blainville in 1816 first adopted the division, according to the method of reproduction, into monodelphs, didelphs, and ornithodelphs, or ordinary mammals, marsupials, and monotremes, retaining for the most part the Linnæan orders. Classification by the placenta seems to have been first proposed by Sir Everard Home, but, as modified by successive naturalists, leads to many unnatural affinities; placing, for instance, rodents and insectivora with monkeys, and solipeds, pachyderms, and some ruminants with the carnivorous cetaceans. Prince Bonaparte, in his *Systema Vertebratorum* (1840), adopts the division of *placentalia* and *implacentalia*, subdividing the first into the sub-classes of *educabilia* and *ineducabilia*, the latter including the orders *bruta*, *chiroptera*, *insectivora*, and *rodentia*, with the common character of a single-lobed cerebrum; Prof. Owen regards this as the most important improvement since the establishment of the natural character of the ovo-viviparous or implantal division. In 1845 Isidore Geoffroy Saint-Hilaire raised the marsupials to the rank of a distinct class, making its subdivisions orders equivalent to those of the *placentalia*; Owen, however, did not regard them as groups of equal rank and value. In 1849 Prof. Owen, from the consideration of the times of formation and the succession of the teeth, divided mammals into two groups, monophodonts, or those which generate a single set of teeth (as the *monotremata*, *bruta*, and *cetacea*), and the diphyodonts, or those which generate two sets of teeth (comprising the great bulk of the class); at the same time he wished it to be clearly understood that this dental character is not so associated with other organic characters as to indicate natural or equivalent sub-classes. As early as 1842 he drew attention

to the value of the principal modifications of the mammalian brain in regard to their association with concurrent modifications in other systems of organs; it was not till 1857, however, that he felt himself justified in proposing to the Linnæan society a fourfold division of this class, based upon the four leading modifications of the cerebral structure. His first and lowest group or sub-class is called *lyencephala*, signifying the loose or disconnected state of the cerebral hemispheres, which leave exposed the olfactory ganglia, the cerebellum, and more or less of the optic lobes, have the surface generally smooth, and the anfractuositities, when present, few and simple; in this division the absence of the corpus callosum commissure is associated with the marsupial mode of development and the non-development of the placenta; it includes the monotremes and marsupials. The next stage in the development of the brain is where the corpus callosum is present, but the hemispheres leave the olfactory lobes and cerebellum exposed, and are commonly smooth or with few and simple convolutions; these are the *lissencephala*, or smooth-brained mammals, or rodents, insectivora, bats, and edentates, in many respects, in common with the preceding subdivision, resembling birds and reptiles. The third modification is an increased relative size

of the hemispheres, which extend over more or less of the cerebellum and olfactory lobes, and have their surface, except in a few of the lower quadrumana, folded into more or less numerous *gyri* or convolutions; hence this sub-class is called *gyrencephala*; among these are not found marks of affinity with the ovipara, but the highest mammalian perfection is attained, as shown by the size, strength, activity, sagacity, and docility of many of its members; this sub-class comprises the other orders of mammals, man only excepted. In man the hemispheres overlap the olfactory lobes and cerebellum, extending in advance of the former and further back than the latter; in man only is there what is called a third or posterior lobe, and in him the superficial gray matter attains its highest development through the number and depth of its convolutions; as representing a distinct sub-class of mammalia, and ruling naturally over all the other members of the class, he proposes for man the name of *archencephala*, signifying that he is master of the earth and of the lower creation. For details on the characters of the secondary groups and their distribution in time and space, the reader is referred to the original paper in the "Proceedings of the Linnæan Society" of London, vol. ii., pp. 1-37, 1857. His tabular arrangement is as follows:

Class.	Sub-class.	Order.	Family or genus.	Example.
MAMMALIA.	ARCHENCEPHALA.	BIMANA.....	<i>Homo</i>	Man.
		QUADRUMANA.....	<i>Catarrhina</i>	Ape.
			<i>Platyrrhina</i>	Marmoset.
			<i>Strepsirrhina</i>	Lemur.
		CARNIVORA.....	<i>Digitigrada</i>	Dog.
			<i>Plantigrada</i>	Bear.
			<i>Pinetigrada</i>	Seal.
			<i>Omnivora</i>	Hog.
		ARTIODACTYLA.....	<i>Ruminantia</i>	Sheep.
			<i>Solidungula</i>	Horse.
	GYRENCÉPHALA.	UNGULATA.....	<i>Multungula</i>	Tapir.
			<i>Elephas</i>	Elephant.
			<i>Dinotherium</i>	Extinct.
			<i>Toxodon</i>	"
		TOXODONTIA.....	<i>Nesodon</i>	"
			<i>Manatus</i>	Sea cow.
		SIRENIA.....	<i>Halicore</i>	Dugong.
			<i>Delphinida</i>	Porpoise.
		CETACEA.....	<i>Balenida</i>	Whale.
			<i>Bradypodida</i>	Sloth.
LISSENCEPHALA.....	GYRENCÉPHALA.	BRUTA.....	<i>Dasypodida</i>	Armadillo.
			<i>Edentula</i>	Ant-eater.
		CHIROPTERA.....	<i>Frugivora</i>	Roussette.
			<i>Insectivora</i>	Bat.
		INSECTIVORA.....	<i>Talpida</i>	Mole.
			<i>Erinaceida</i>	Hedgehog.
		RODENTIA.....	<i>Soricida</i>	Shrew.
			<i>Non-claviculata</i>	Hare.
		CLAVICULATA.....	<i>Rat</i>	"
			<i>Rhizophaga</i>	Wombat.
LYENCEPHALA.....	LYENCEPHALA.	MARSUPIALIA.....	<i>Poëphaga</i>	Kangaroo.
			<i>Carpophaga</i>	Phalanger.
		MONOTREMATA.....	<i>Entomophaga</i>	Opossum.
			<i>Echidna</i>	Echidna.
			<i>Ornithorhynchus</i>	Duck-bill.

The later classification of Huxley does not differ materially in its orders from that of Owen.—Among the many recent American laborers in the department of mammalian classification may be mentioned Prof. Theodore Gill of Washington, D. C., whose articles on this subject, too long to be condensed here, will be found in the "Proceedings of the American

Association for the Advancement of Science" for 1870 and 1871.—The fossil mammals must be considered before the student can form an idea of the affinities of the class; these and the orders of existing mammalia will be treated under their respective titles. The mammalian class has existed certainly from the lower æolitic period, and probably from the triassic; during

this immense lapse of time genera and species have changed, either that they have been newly created at the several epochs, or, as Darwin and others maintain, have been modified by processes of natural selection and development, many original and intermediate forms having become extinct, and, from the imperfection of the geological record, as yet having afforded no indication of their existence. None of the mammalian genera of the secondary epoch have been found in the tertiary ones; no genus of the older eocene has been discovered in the newer; very few eocene genera have been found in the miocene, and none in the pliocene; many of the miocene genera are peculiar to that division, and some indistinguishable from existing species begin to appear only in the newer pliocene; while the perissodactyls and omnivorous artiodactyls have been gradually dying out, the true ruminants have been increasing in genera and species. One class of organs seems to govern one order, and another class another order; for example, the teeth, which are so diversified in marsupials and edentates, are remarkable for the constancy of their characters in rodents and insectivora; and as a general rule, the characters from the dental, locomotive, and placental systems are more closely correlated in the *gyrencephala* than in the two inferior sub-classes.

MAMMARY GLANDS, the organs which secrete the nutritive fluid, milk, by which the young of man and the mammalia are nourished during the early periods of life. They vary from two in the human female to 10 or 12 in the lower mammals, and may be pectoral as in the former, or pectoral and abdominal, or only abdominal, as in the latter. Each gland is made up of a number of separate lobules, more or less closely connected by fibrous tissue and fat, and bound down by the same to the pectoral or abdominal muscles. The lactiferous tubes arising from the minute ultimate follicles of the lobules terminate in the mammillary tubes of the nipple, 10 or 12 in the human female, straight but of variable size; at the base of the nipple, and extending into the gland, are reservoirs for containing a constant supply during lactation; these are often much larger in the lower animals than in woman. The skin covering them is very delicate and smooth; the colored circle around the nipple is called the *areola*, which becomes darker during and after gestation; the irregular surface of the nipple is covered with a very sensitive skin, and much erectile tissue enters into its substance. The tubes are lined with a very vascular mucous membrane, which has its own secretion sometimes in considerable quantity. These glands, especially during lactation, are well supplied with blood from branches of the subclavian and axillary arteries; their nerves come from the brachial plexus and the intercostals, and the sympathetic plexus accompanying the mammary arteries. The inner surface of the follicles is covered with a layer of

epithelium cells, the real agents in the secreting process. They present no great difference in size in the sexes until near the age of puberty, when a considerable enlargement takes place in the female; from the increased supply of blood during gestation, there is a sense of tenderness and distention which is one of the earliest and most valuable signs of pregnancy. These glands in the male are miniatures of those of the female, but the essential structure is the same, as is shown by the authentic cases in which they have become sufficiently developed in men to produce a secretion of true milk. Though the functional activity of these glands is naturally limited to the period succeeding parturition, their secretion is sometimes seen in virgins and in aged women, in whom a strong desire to furnish milk and a continual irritation of the nipple by the infant's mouth have stimulated the organs to unnatural activity. The prolonged secretion of milk in domestic cows, which usually lasts for about ten months after calving, is simply a continued action of these glands due to artificial treatment. The presence of these organs has given the name to the *mammalia*, the highest class of vertebrated animals, implying a mode of intra-uterine and extra-uterine development not found in birds, reptiles, or fishes. Physiologically these glands belong to the generative system, and are gradually removed from the caudal to the pectoral region, as we ascend from cetaceans to the human female; the forward, outward, and upward direction of the nipples is exactly adapted to the position of the child lying in its mother's arms, and the greater abundance of the lactiferous tubes at the lower portion of the breast forms a soft cushion for its head to rest upon. In the African and sometimes in other races, after lactation, the skin covering the breasts becomes so lax, and the organs so elongated, that they can be thrown over the shoulders like bags. The mammary glands are subject to many painful and dangerous diseases, among which may be mentioned acute and chronic inflammations, abscesses, and encysted, fibrous, and cancerous tumors; they are sometimes enormously overloaded with fat.

MAMMEE APPLE (*mammea Americana*), a handsome tree of 60 ft. in height, native of the Caribbean islands and the neighboring continent. It has large, oval or obovate, shining, leathery, opposite leaves, white, sweet-scented flowers, and large, round, obsoletely three- or four-cornered fruit, which sometimes grows to the size of a child's head. The fruit is covered with a double rind; the outer is leathery, tough, and brownish yellow; the inner, thin, yellow, closely adhering to the flesh, which is firm, bright yellow, and of a singular pleasant taste and a sweet aromatic smell; but the skin and seeds are very bitter and resinous. The pulp is eaten alone, or cut up into slices with wine and sugar, prepared as a jam or marmalade, or with sirup. From the yellowness of

the pulp, like that of an apricot, it is called by the French *abricot sauvage*. This fruit is occasionally brought to our seaport cities, but rarely in an eatable condition. The seeds,



Mammee Apple.

which are sometimes as large as hen's eggs, are used as anthelmintics, and an aromatic liquor called *eau de créole* is distilled from the flowers. The tree belongs to the natural order of *guttifera*. Browne ("Natural History of Jamaica," London, 1756) speaks of the species as among the largest trees of Jamaica, and esteemed among the best timber trees. It has been observed that no one can behold this tree towering above a cluster of fruit trees without a sentiment of respect for it. The mammee tree has become naturalized in some parts of Africa, where it produces excellent fruit. Two or three other species, natives of tropical Asia, are known to botanists.

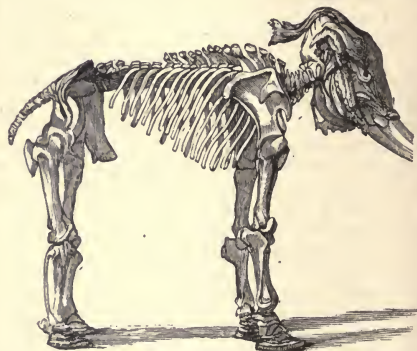
MAMMOTH, the fossil elephant of Siberia (*elephas primigenius*, Blumenbach), found in



Mammoth (*Elephas primigenius*).

the diluvial strata of Europe and Asia, and perhaps also in North America. Large fossil bones were alluded to by Theophrastus, Pliny, and many ancient authors, and were general-

ly supposed to be the remains of giant men. They are abundant in the drift of central and northern Europe, mingled with the bones of other pachyderms, principally in river basins; in Great Britain, in the Kirkdale cavern of Yorkshire; in Sweden and Norway; but most abundantly in the frozen region of European and Asiatic Russia, about the mouths of rivers descending into the icy sea; there is indeed hardly a river in Siberia in whose bed or on whose banks these remains have not been found, as well as in the neighboring plains, in connection with bones of other animals now strangers to the climate; they are not found in the elevated districts. In Siberia fossil ivory is so abundant and so well preserved that it gives rise to a considerable traffic both for home and foreign use. The most remarkable discovery in relation to the mammoth was the occurrence of a carcass found by a Tungus fisherman in a block of ice on the border of the Arctic sea in 1799, near the river Lena; in the course of



Skeleton of Mammoth.

a few years this immense mass was thawed out, and it was found to be an elephant having the flesh and soft parts well preserved, with the exception of such portions as had been devoured by bears, dogs, and other carnivorous animals; the tusks were very fine, weighing 300 lbs., and were removed by the fisherman. In 1806 Mr. Adams, travelling for the museum of St. Petersburg, visited the locality and collected the remains, which were transported to St. Petersburg, where this skeleton now is, with many others, in a nearly perfect condition; he ascertained that the skin had an abundant covering of hair and wool, indicating that it was fitted to resist a cold climate. It is evident that the climate of Siberia during the diluvial period was not like that of the regions now inhabited by elephants; it must have been moderately cold, though such as would permit the growth of a vegetation more luxuriant than any in the present arctic regions, and sufficient for the nourishment of these bulky animals. Another more recently discovered specimen allowed even a microscopic examination of the tissues. The following are the differences be-

tween the fossil and living elephants, as determined by Cuvier. In the former the laminae of the teeth are narrower and more numerous than in the Indian elephant, which they most resemble, with the lines of enamel more slender and less festooned, and the teeth absolutely



Tooth of Mammoth.

and relatively wider. The tusks are larger than in most living specimens, and generally more curved, but the structure is the same. In the skull, there is much greater length and perpendicularity in the sockets for the tusks; the head is more elongated, with a greater development of occiput, and concave and nearly vertical forehead; the long alveoli must have modified the trunk, and have given the animal a different physiognomy from that of the present elephant; the antero-posterior length of the lower jaw is less, the lower molars are parallel instead of converging forward, and the jaw is truncated in front instead of having a projecting grooved symphysis. The bones of the limbs are more massive, and the usual distance between the two condyles of the femur is reduced to a narrow line. The skin is like that of the living elephant, but is covered with hair of three kinds; the longest, 12 or 15 in., is brown and like horse hair; the shorter, 9 or 10 in., is more delicate and fawn-colored; and the wool at the base of the hair, 4 or 5 in. long, is fine, smooth, fawn-colored, and a little frizzled toward the roots; there is a mane on the neck, and the whole covering is well suited for a cold climate. The mammoth has never been found living, nor have any of the existing elephants been discovered in the fossil state; it was probably not much if at all higher than the elephants of the present epoch, but was stouter, more clumsy, and heavier. Their bones are found mingled with those of the rhinoceros, ox, antelope, horse, often with marine animals, and sometimes with fresh-water shells. They were undoubtedly overwhelmed by a comparatively recent and sudden catastrophe during some portion of the long drift period, accompanied by a depression of temperature, and probably by a subsidence of the land and an invasion of the sea, general over the northern regions of both hemispheres; during the preceding tertiary epoch there was an elevation of temperature, permitting tropical animals to go far to the north; this temperature gradually became colder, the animals becoming adapted for it, as shown by their external covering, until they suddenly became extinct during the glacial period of the drift. From the abundance of the remains found in Siberia, it is inferred that elephants were more numerous during the diluvian epoch than at the present time. To the *E. primigenius* belong the Siberian fossils, and most, if not all, of those of the drift of Europe.—Several species of fossil elephant have been found in

North America, referred by some to the *E. primigenius*. Prof. H. D. Rogers ("Proceedings of the Boston Society of Natural History," vol. v., Feb. 1, 1854) drew attention to the fact that while the European mammoth is found in the drift stratum, the North American fossil elephant is imbedded in strata above the drift, of a distinctly more recent age, and was a contemporary of the *mastodon giganteus*, their bones being found together in the marshy alluvium of Big Bone Lick; he maintains that they lived together in the long period of surface tranquillity which succeeded the strewing of the general drift (the period of the Laurentian clays), and were overtaken and exterminated together by the same changes, partly of climate, partly of a second but more local displacement of the waters which reshifted the drift, and formed the later lake and river terraces. From figures on bones, it is beyond doubt that the mammoth lived with man in the early stone age. In the pliocene deposits of Kansas and Nebraska Dr. Hayden found bones of mastodon and elephant (*E. imperator*, Leidy), and a similar coexistence has been ascertained in the pliocene of Europe; the remains of this and *E. americanus* have been found in Kentucky, Texas, Mexico, Spanish America, from Alaska to Georgia and the Mississippi valley, and as far west as Oregon and California. The elephants of the tertiary sub-Himalayan Sivalik hills have been described by Cautley and Falconer; in these the dental laminae are so separated that each forms the summit of a ridge, making a transition from elephant to mastodon, constituting the genus *stecodon* (Cautley and Falconer). The mammoths of the American continent are now admitted to be different species from those of Europe and Asia.—For details on the mammoth, see Cuvier's articles in vol. viii. of the *Annales du Muséum*, and in vol. i. of the *Ossemens fossiles*; Pictet's *Traité de paléontologie*, vol. i.; vol. v. of the "Naturalist's Library," which treats of the pachyderms; and vols. ii. and iv. of the "American Naturalist."

MAMMOTH CAVE, the largest cavern known, situated in Edmondson co., near Green river, in Kentucky, about 75 m. S. S. W. of Louisville. Its mouth is reached by passing down a wild rocky ravine through a dense forest; it is an irregular, funnel-shaped opening, from 50 to 100 ft. in diameter at the top, with steep walls about 50 ft. high. The cave extends about nine miles, and it is said that to visit the portions already traversed requires from 150 to 200 miles of travel. This vast interior contains a succession of marvellous avenues, chambers, domes, abysses, grottoes, lakes, rivers, cataracts, &c., which for size and wonderful appearance are unsurpassed. The rocks present numerous forms and shapes of objects in the external world, while stalagmites and stalactites of gigantic size and fantastic form abound, though not so brilliant and beautiful as are found in some other caves. Chief among the objects of

interest are Silliman's avenue, about $1\frac{1}{2}$ m. long, from 20 to 200 ft. wide, and from 20 to 40 ft. high; Marion's avenue, of about the same dimensions; the Star chamber, about 500 ft. long and 70 ft. wide, the ceiling of which, 70 ft. high, is composed of black gypsum, and is studded with innumerable white points, which by a dim light present a most striking resemblance to stars; and Cleveland's cabinet, an avenue about 2 m. long, spanned by an arch of 50 ft., with an average central height of 10 ft. By many the last is regarded as the most wonderful object in the cave. "It is incrustated from end to end with the most beautiful formations in every variety of form. The base of the whole is sulphate of lime, in one part of dazzling whiteness and perfectly smooth, and in other places crystallized so as to glitter like diamonds in the light. Growing from this, in endless diversified forms, is a substance resembling selenite, translucent and imperfectly laminated. Some of the crystals bear a striking resemblance to celery, and all are of about the same length; while others, a foot or more in length, have the color and appearance of vanilla cream candy; others are set in sulphate of lime, in the form of a rose; and others still roll out from the base in forms resembling the ornaments on the capital of a Corinthian column. Some of the incrustations are massive and splendid; others are as delicate as the lily, or as fancy work of shell or wood." Proctor's arcade is a magnificent natural tunnel three fourths of a mile long and 100 ft. wide, covered by a ceiling of smooth rock, 45 ft. high. The Temple or Chief City is a chamber having an area of between four and five acres, and covered by a single dome of solid rock 120 ft. high. Lucy's dome, the highest of the objects of this class, is over 300 ft. high and about 60 ft. in its greatest diameter. Mammoth dome and Stella's dome are each about 250 ft. high, while Gorin's dome is about 200 ft. Sidesaddle pit, over which rests a dome 60 ft. high, is about 90 ft. deep and 20 ft. across. This and some of the other pits and domes in the cave have been formed out of the solid rock by the solvent action of water charged with carbonic acid. The deepest of the pits are the Maelstrom, 175 ft. in depth and 20 in diameter, and the Bottomless pit, of about the same depth. There are several bodies of water in the cave, the most considerable being Echo river, which is about three fourths of a mile long, 200 ft. wide at some points, and from 10 to 30 ft. deep; its course is beneath an arched ceiling of smooth rock about 15 ft. high. This river has invisible communication with Green river, the depth of water and the direction of the current in the former being regulated by the stage of water in the latter. The river Styx, 450 ft. long, 15 to 40 wide, and from 30 to 40 deep, is spanned by an interesting natural bridge about 30 ft. above it. Lake Lethe is about 450 ft. long and from 10 to 40 wide, and varies in

depth from 3 to 30 ft.; it lies beneath a ceiling about 90 ft. above its surface; its waters sometimes rise to the height of 60 ft., in consequence of freshets in Green river. The Dead sea is a gloomy body of water somewhat smaller than the preceding. Two remarkable species of animal life are found in the cave, in the form of an eyeless fish and an eyeless crawfish, which are nearly white in color. Another species of fish has been found with eyes, but totally blind. Other animals known to exist in the cave are lizards, frogs, crickets, rats, bats, &c., besides ordinary fish and crawfish washed in from Green river. The atmosphere of the cave is pure and healthful; the temperature, which averages 59° , is about the same in winter and summer, not being affected by climatic changes without.—The Mammoth cave was discovered in 1809, and has always been the property of private individuals. For some time after its discovery saltpetre was made here. In this vicinity are also Proctor's cave, about 3 m. in length; White's cave, Diamond cave, and Indian cave, each about a mile long. Several accounts of this wonderful curiosity have been published, the most recent and complete being "The Mammoth Cave," by W. Stump Forwood (Philadelphia, 1870).

MAN. See ANATOMY, ARCHEOLOGY, COMPARATIVE ANATOMY, ETHNOLOGY, MAMMALIA, PHILOSOPHY, and PHYSIOLOGY.

MAN, Isle of (Manx, Mannin, or Ellan Van-nin; Lat. *Monapia*), an island belonging to Great Britain, in the Irish sea, about midway between England, Scotland, and Ireland, its centre lying in lat. $54^{\circ} 16' N.$, lon. $4^{\circ} 30' W.$; length N. N. E. and S. S. W. 31 m., greatest breadth 12 m.; area, 227 sq. m.; pop. in 1871, 54,042. The coasts are very irregular, and on the east and southwest are precipitous. There are numerous bays with good anchorage. A ridge of mountains traverses the length of the island, culminating in Mt. Snaefell at an elevation of 2,024 ft. above the sea. Its prevailing geological formation is clay slate, varied on the E. side with large masses of granite. The principal rivers are the Neb, Colby, and Black and Gray Waters, all of which are very small. The climate is mild and equable, the mean temperature of summer being about $60^{\circ} F.$ and of winter 42° . The chief mineral resources of the island consist of lead, zinc, copper, and iron; lead is extensively mined. The soil is fruitful, but agriculture is not in a very forward state. Oats, barley, wheat, potatoes, turnips, and hay are the principal crops. A native breed of small sturdy horses, an inferior kind of sheep, horned cattle, and pigs in great number, are among the domestic animals. The island possesses a breed of cats having either no tail, or at most a merely rudimental substitute for it. Sea birds and some rare kinds of fish are also found. The fisheries of herring were formerly the principal reliance of the islanders, but of late have become inconsiderable. There are

some bleaching works, but few manufacturing establishments. The government is vested in the queen in council, the governor, and the "house of keys," a self-perpetuating body, consisting of 24 landed proprietors, who are considered the representatives of the people, and whose concurrence is necessary to give validity to every law; the acts of the British parliament do not affect the isle of Man unless expressly extended to it. The governor is appointed by the crown and assisted by a council of officers. Besides the ordinary civil and ecclesiastical courts, there are ancient tribunals called "deemsters' courts," the judges of which, called deemsters, are chosen by the people, one for the N. and another for the S. division of the island, and possess very extensive authority. Questions relating to the herring fishery are tried before an officer called the water bailiff, who also appoints two fishermen called admirals to preserve order among their fellows. The established religion is that of the church of England, under the bishop of Sodor and Man, who has a seat but no vote in the British house of lords.—The island was originally peopled by the Manx, a Celtic tribe, whose language, a sub-dialect of the Gaelic or Celtic, forming one branch with the Erse and Irish, is still spoken in the northwest and west, though English is generally understood. The island was held for some time as a feudal sovereignty by the earls of Derby, and afterward by the dukes of Athol, from whom the sovereignty and revenues were purchased by the crown in 1765 for the sum of £70,000, to which an annuity of £2,000 was subsequently added. In 1829 the ducal family's remaining interests in the island, including the manorial rights and patronage of the see, were sold to the crown for £416,114. The chief towns are Castletown (the capital), Peel, Douglas, and Ramsay.

MANAGUA, a city and the capital of Nicaragua, and of the department of Granada, situated on the S. shore of the lake of the same name, 220 ft. above the level of the Pacific, in lat. 12° 7' N., lon. 86° 12' W.; pop. about 6,500, for the most part proprietors of the fertile lands which surround it, and which are productive in all tropical staples. The public buildings are few and devoid of beauty. The old parish church, which was in a state of ruin, has been demolished, and a new edifice is in process of construction; and there are four other churches. The national palace is a low square edifice with balconies in the Spanish style, the only ornate portions of which are the congress halls and those occupied by the president of the republic. A new structure beside the palace contains the *cabildo* or city hall, a prison, and barracks. The environs of Managua are very picturesque; on the declivities of the mountain range to the south there are more than 100 coffee plantations, yielding copious crops, despite the lack of water for irrigation in some of them; and in another direction are the

lakes of Tiscapa, Nejapa, and Asososca, near the banks of which last exist curious antique paintings. Managua owes its rank as capital chiefly to the rivalries of the cities of Granada and Leon, and partly to its central position.

MANAGUA, Lake, a beautiful body of water in Nicaragua, about 40 m. long by 16 m. wide, 157 ft. above the Pacific ocean, from which it is separated by a ridge of land 15 m. broad in its narrowest part. It has a depth of water varying from 2 to 40 fathoms; but numerous moving sand banks render its navigation difficult for large vessels. The N. and E. banks are unhealthy marshy deserts; the W. shores are sandy, interspersed with bold rocks; and there are several ports, that of Managua being the best, and the point designated for the inland terminus of the projected railway from the lake to the port of Corinto *via* Leon. It has an outlet at its S. extremity called Rio Tipitapa or Estero de Panaloya, connecting it with Lake Nicaragua. The difference of level between the two lakes, at average stages of water, is 28 ft. The Rio Tipitapa, during severe rainy seasons, has a considerable body of water; but it is frequently almost dry, the evaporation from the surface of the lake exceeding the supply of water from its tributaries, which are all intermittent streams, except Sinogapa and Rio Viejo. In the various projects for an interoceanic communication through Nicaragua, it has been proposed to connect the two lakes by means of a canal, deepening the Tipitapa and constructing a series of locks to the superior lake, with another canal from the lake to the port of Realejo, or by means of the Estero Real to the bay of Fonseca. Between the N. portion of the lake and the Pacific there is only the magnificent plain of Leon, having an elevation at its highest part of about 50 ft. above the level of water in the lake. The volcano of Momotombo projects boldly into the lake at its N. extremity, and within the lake itself rises the island cone of Momotombita, which had a sacred reputation among the aborigines, and still contains numbers of their idols and other monuments, concealed beneath the shadows of its dense forests. The city of Leon was first built on the shore of the N. W. extremity of the lake, at a place called Imbita, abandoned for the present site in 1610.

MANAKIN, the name applied to the denterostral birds of the family *ampelidæ* or chatterers and subfamily *piprinæ*; they are generally small and of brilliant colors, and with one exception inhabitants of the warmer parts of South America. They have a moderate or short bill, depressed, with broad base, curved ridge, compressed sides, and toothed tip; the nostrils are hidden by the frontal feathers; the wings generally short and pointed; tail short and even; tarsi moderate and slender; toes long, the outer united to the middle to beyond the second joint; claws acute. The red manakin or chatterer (*phanicercus carnifex*, Swains.) is

about 7 in. long; the crest, lower back, rump, lower belly, thighs, and vent, bright crimson; rest of plumage dull red, dusky on the back; tail crimson, with end and outer web dusky brown; the female is of a general greenish olive color, with tinges of red on the head, ab-



Red Manakin (*Phoenicercus carnifex*).

domen, and tail; the young birds are brownish with whitish markings. This and the *P. nigricollis* (Swains.) inhabit the eastern parts of tropical South America.—The blue-backed manakin (*pipra pareola*, Linn.) is $4\frac{1}{2}$ in. long; the plumage is black, with the back and lesser wing coverts blue, and a crest of bright crimson feathers; the female and young are greenish. There are more than 30 other species. These beautiful and active birds inhabit damp woods, on the borders of which they live in small flocks, seeking for insects and fruits.—The rock manakins belong to the genus *rupicola* (Briss.), of which the best known species



Orange Manakin (*Rupicola crocea*).

is the orange manakin or cock of the rock (*R. crocea*, Bonn.); the plumage is saffron orange, with the quills partly white and partly brown, and the wing coverts loose and fringed; it has a singular crest of feathers arranged in two planes, arising from the sides of the head and

meeting over and in front of the bill; the size is that of a small pigeon. This handsome species inhabits rocky places near the borders of the streams in Guiana, and its legs and feet are nearly as stout as in a gallinaceous bird of the same size, whence its common name; it is active and suspicious, feeding on fruits and berries; the nest is placed in holes in the rocks, composed of roots, grass, and earth, lined with finer materials; it lays two white eggs, about the size of those of a pigeon; it is now comparatively rare, as it is hunted for the beauty of its plumage. There is a species in Peru (*R. Peruviana*, Lath.), of a reddish saffron color, with black quills and tail, and ashy wing coverts; it is a little larger than the other.—The only old-world representative of this subfamily belongs to the genus *calyptomena* (Raffles), found in the thick forests of Java and Sumatra; the plumage is shining green, with a spot on each side of the nape, three oblique stripes on the wings, and the quills, except the outer margins, dark-colored. The only species described by Gray is the green manakin (*C. viridis*, Raffl.), about 6 in. long; the color so nearly resembles the foliage of the high trees upon which it generally perches, that it is very difficult to see and to procure; its food is entirely vegetable.

MANASSAS JUNCTION, Battle of. See BULL RUN.

MANASSEH. I. The elder son of Joseph, son of Jacob, adopted by the latter on his deathbed to become the head of one of the tribes of Israel, yet made inferior to his younger brother Ephraim. At the time of the census at Sinai the tribe of Manasseh numbered 32,200, and 40 years later 52,700. On the conquest of Palestine, half of the tribe received from Moses its allotment E. of the Jordan, N. of Gad, and the other half received from Joshua the region W. of the Jordan, between Issachar on the north and Ephraim on the south, the Mediterranean forming the western boundary. The eastern division contained among others the districts of Ituræa, Trachonitis, Gaulonitis, Batanæa, and part of Gileaditis, and the towns of Gadara, Ashtaroth, Edrei, Gamala, Jabesh-Gilead, Mahanaim, and Gerasa. The western division was less important in history, it being almost always overshadowed by its southern neighbor, Ephraim. **II.** A king of Judah, 696–641 B. C. See HERBES, vol. viii., p. 589.

MANATEE, Lamantin, or Sea Cow, a large aquatic mammal (*manatus*, Cuv.), which was arranged by Cuvier among cetaceans, forming with the dugong the herbivorous group of this order, the family *sirenia* of Illiger. Recently, on account of the many important differences in their organization, they have been removed from cetaceans and placed in an order called sirenoids, intermediate between the old order of pachyderms and the cetaceans. The manatee has an elongated, fish-like body like that of the whales, the anterior limbs be-

ing flattened into fins, and the posterior limbs wanting and only represented by a rudimentary pelvis; the tail is oval, about one fourth of the extent of the body, ending in a flattened, horizontal, rounded caudal expansion; in these respects it resembles cetaceans. It differs from cetaceans in the separation of the cervical vertebrae; the smaller total number in the whole column, and the absence of osseous disks between the bodies; the articulation of the ribs to two vertebral bodies and to transverse processes; the long and narrow scapula; the regularly shaped humerus; the rounded radius and ulna; the compact structure of the phalangeal bones; the wide separation of the occipital condyles, and their partly horizontal position, and the large size of the occipital foramen; the well marked and strong sutures, and the absence of internal bony fauces; the fusion of the parietals into one; the position of the frontals as usual in front of the parietals; the strong zygomatic arches; the



Manatee (*Manatus latirostris*).

symmetry of the cranial bones and their usual position; the shape of the jaws, and the character of the molars; and the structure of the stomach and heart. Many other distinctions are given in the "Proceedings" of the third meeting of the American association for the advancement of science, Charleston, S. C., 1850 (pp. 42-47). The head is conical, without a distinct line of separation from the body; the fleshy nose much resembles that of a cow, the nostrils opening as usual on the end of the snout; the full upper lip has on each side a few bristly tufts of hair; the mouth is not large, and the eyes are small; the openings of the ears are very small. The swimming paws are more free in their motions than in cetaceans, and may be used also for crawling up the muddy banks of the rivers in which they dwell; the separate bones may be felt through the skin, and the fingers are provided with small nails. The skin is of a grayish black color, becoming black on drying, with a few scattered bristles. In the young animal

there are two sharp incisor teeth in the upper jaw, which afterward fall out; there are no canines; the molars are generally $\frac{3}{8}$ - $\frac{1}{2}$, with quadrangular flat crowns, divided by a transverse groove. The bones are dense and heavy, differing in this from cetaceans; the ribs are numerous and rounded; the mammae are two and pectoral; the intestinal canal is 10 or 12 times the length of the body, in accordance with the vegetable character of their food; the stomach has two caecal appendages in the pyloric portion, which is separated from the cardiac by a constriction. They inhabit the sea shores, especially about the mouths of rivers, and the rivers themselves, keeping near the land, feeding upon algæ and aquatic plants; they do not feed upon the shores, though they sometimes quit the water, and not unfrequently support themselves in the shallows in a semi-erect position; under these circumstances they present at a distance somewhat of human appearance, increased by the distinct lips, the long whiskers in the male, and the pectoral mammae in the female. The largest and best known species is the Florida manatee (*M. latirostris*, Harlan), which inhabits the gulf of Mexico and the West Indies; it sometimes attains a length of 15 or 20 ft., but is generally about 12. They are usually seen in small troops, associating for mutual protection and for the defence of their young; they are harmless even when attacked, of gentle disposition, not afraid of man, and rarely quarrelling with each other. Being found only in shallow waters, they are easily captured. Their flesh is wholesome and palatable. The South American manatee (*M. australis*, Wieg.), usually 9 or 10 ft. long, is not uncommon about the mouths of the great rivers of northern Brazil and Guiana; it ascends the streams several hundred miles, and even into inland fresh-water lakes; the flesh of this aquatic mammal is considered fish by the Roman Catholic church in Brazil, and may consequently be eaten on fast days; salted and dried in the sun, it is an excellent meat; the oil from the blubber is of fine quality, and free from smell; the hide is made into harnesses and whips, and is noted for strength and durability. An African species (*M. senegalensis*, Desm.) is rarely more than 9 ft. long. The manatees are all tropical, but are not found in the Pacific or Indian oceans, their place being there taken by the allied dugongs (*halicore*, Illiger).—There was among the Russians an animal called the northern manatee or sea cow; this is the creature described by Steller, forming the genus *ryhtina* (Ill.) or *Stellera* (Cuv.). This, the *R. Stelleri* (Desm.), was unknown before 1741, when Behring's second expedition was wrecked on an island in the straits bearing his name; its flesh formed the principal food of the shipwrecked mariners for nearly a year; one of the party, Steller, described the animal, and his account was published in St. Petersburg, and probably contains all that will

ever be known concerning it, as in 1768 the crews of the ships in pursuit of sea otters had entirely exterminated it; it has met the fate of the dodo, but at a much more recent period; a skull and a few fragments are said to exist in European museums. It had no teeth, the jaws being covered with an undulating surface of horny tubular matter; the head was small, the body covered with a thick, fibrous, fissured epidermis, and the caudal fin lunate. It attained a length of 25 ft., and formerly lived in the neighborhood of Behring island on the coast of Kamtchatka. The epidermis had a singular structure, being composed of perpendicular horny tubes, sometimes an inch in length, of a blackish brown color, rough and wrinkled like the bark of a tree, and so tough as to be with difficulty cut with an axe; it served to protect the animal from the ice and sharp rocks among which it fed. They lived in shallow water in troops, the older protecting the younger; they were harmless and very tame, and strongly attached to each other; they fed on fuci under water, and the skin, fat, and flesh were esteemed by the natives.

MANATEE, a S. W. county of Florida, bordering on the gulf of Mexico, touching Lake Okeechobee at the S. E. corner, bounded S. by the Caloosahatchee river, and watered by the Manatee river, Pease creek, and other streams; area, 4,070 sq. m.; pop. in 1870, 1,931, of whom 88 were colored. Along the coast are numerous low sandy islands, within which lie Sarasota bay and Charlotte harbor. The surface of the mainland is low and level, and not very fertile. The chief productions in 1870 were 12,727 bushels of Indian corn, 21,652 of sweet potatoes, 29 bales of cotton, 41 hogsheds of sugar, and 71,452 lbs. of rice. There were 330 horses, 44,970 cattle, and 5,197 swine. Capital, Manatee, or Pine Level.

MANAYUNK. See PHILADELPHIA.

MANBY, George William, an English officer, born at Hilgay, Norfolk county, Nov. 28, 1765, died at Southtown, Nov. 18, 1854. He was educated at the military college of Woolwich, and became in 1803 barrack master at Great Yarmouth. Here he attempted casting a rope from the shore to a wreck by means of gunpowder. The problem to be solved was the maintenance of the connection between the rope and the mortar during its transmission. Chains were unable to stand the shock of the discharge, but stout strips of raw hide closely platted together were found to answer; and on Feb. 12, 1808, the entire crew of the brig Elizabeth, wrecked within 150 yards of the beach, were rescued by this simple contrivance. In 1810 his invention was brought before a committee of the house of commons, and he received a grant of money, and all the dangerous stations on the British coasts were supplied with his apparatus. He also contrived a pyrotechnic which renders vessels visible from shore on the darkest night; and shells filled with luminous matter, to enable the crew to

perceive the approach of the rope. He published "The History and Antiquities of the Parish of St. David, South Wales" (1801), and kindred works; also "Journal of a Voyage to Greenland in 1821" (1822).

MANCHA, La, an old province of Spain, chiefly in the S. part of New Castile, now included in the central and eastern portions of Ciudad Real, and the adjoining parts of Cuenca and Albacete; area, about 7,000 sq. m.; pop. about 200,000. The N. W. and S. E. portions are mountainous, and the centre in general a desolate sandy plateau. The towns are few and uninteresting; the cottages in the villages are built of mud. Most of the country is denuded of trees, exposed to the wintry blasts, and scorched by the summer heat. The earth is arid and stony; the dust is impregnated with saltpetre, and the glare of the sun almost blinds the eye. Water is wanting, and dry dung is used for fuel. In some places, however, corn, saffron, and wines are produced; and the mules of La Mancha are celebrated. The natives are jovial, honest, industrious, brave, and temperate. The scenery has become celebrated by the descriptions in "Don Quixote."

MANCHE, La, a N. W. department of France, in Normandy, bordering on the English channel and the departments of Calvados, Orne, Mayenne, and Ille-et-Vilaine; area, 2,289 sq. m.; pop. in 1872, 544,776. The coast is generally flat, and lined with swamps. There are several excellent harbors, the principal of which are Cherbourg, La Hogue, and Granville. La Manche has several short but navigable rivers, the principal of which is the Vire, and is traversed from N. to S. by a hilly range of moderate height, called Cotentin, which gives its name to the peninsular portion of the department. The rest of the surface is undulating, the soil rich, and the climate moist and mild. A prevailing crop is a species of black oats. The quantity of cider made is very great. A considerable portion of the land is under pasture. The horses are among the best in France. Iron, lead, and coal are mined, and granite, marble, slate, and limestone are quarried. Salt is largely manufactured on the coast, and in the towns iron, zinc, copper, woollen, and cotton. The department is divided into the six arrondissements of St. Lô, Avranches, Cherbourg, Coutances, Mortain, and Valognes. Capital, St. Lô.

MANCHESTER, one of the shire towns of Hillsborough co., New Hampshire, and the largest city in the state, situated on both banks (but chiefly on the E.) of the Merrimack river, 18 m. S. by E. of Concord, and 46 m. N. W. of Boston; pop. in 1850, 13,932; in 1860, 20,107; in 1870, 23,536, of whom 7,158 were foreigners, including a considerable number of French Canadians. The villages of Amoskeag and Piscataquog are on the W. side of the river, which is crossed by five bridges. The city is regularly laid out in squares, and the main street is 100 ft. wide, planted with elms on each side at in-

tervals of 40 ft. for more than a mile. There are five public squares of considerable extent in the central portion, three of them containing ponds. Valley cemetery, the largest in the city, is situated in the S. W. part, E. of the Merrimack; and there are two small cemeteries W. of the river. Manchester has railroad communication with Boston, Concord, Portsmouth, and other points, by means of the Concord, the Manchester and Lawrence, the Manchester and North Weare, and the Portsmouth railroads. It is one of the principal manufacturing cities of New England,

being supplied with ample water power by the Blodgett canal, built in 1816 around the Amoskeag falls in the Merrimack. The fall is 47 ft., with rapids above, giving a total descent of 54 ft. in the space of a mile. The water power is owned by the Amoskeag manufacturing company, which has a reservoir in the N. E. part of the city capable of holding 11,000,000 gallons, for supplying the mills. The following table exhibits the statistics of the five corporations engaged in the manufacture of cotton and woollen goods in 1874:

CORPORATIONS.	Date of incorporation.	Capital.	No. of looms.	Spindles.	Operatives.	Yards manufactured per week.	Lbs. of cotton and wool consumed per week.
Amoskeag manufacturing company.....	1831	\$3,000,000	3,500	125,000	4,200	600,000	200,000
Stark mills.....	1838	1,250,000	1,800	40,000	1,200	380,000	110,000
Manchester print works.....	1839	1,800,000	2,150	100,000	3,000	400,000	110,000
Langdon manufacturing company.....	1857	500,000	704	33,600	500	100,000	28,000
Namaske mill.....	1857	100,000	....	5,000	100	.....	.....
Total.....	.....	\$6,650,000	7,654	303,600	9,000	1,480,000	448,000

Of the operatives, 2,700 were males and 6,300 females. The Amoskeag company also manufactures steam fire engines, and the Manchester company operates extensive print works. The Manchester and Namaske companies manufacture woollens as well as cottons, and the Stark mills some linens; the others, only cotton goods. The principal kinds of goods are tickings, denims, stripes, gingham, sheetings, shirts, print cloths, balmorals, cotton flannels, cotton duck, seamless bags, delaines, angola flannels, fancy cassimeres, alpacas, poplins, silesias, &c. The Amoskeag paper mill employs about 40 hands. There are also a manufactory of hosiery, one of boots and shoes, one of edge tools, one of locomotives, several of machinery and iron castings, of carriages, and of circular saws, a brass foundry, and an ale brewery. The city contains four national banks, with an aggregate capital of \$650,000; five savings banks, with about 18,500 depositors and \$7,250,000 deposits; and a fire insurance company, with \$200,000 capital. It is divided into seven wards, and is governed by a mayor and a board of aldermen of one member and a common council of three members from each ward. There is an efficient police force, and the fire department is well organized. The streets are well paved and sewered and lighted with gas. Water is supplied from Lake Massabesic on the N. E. border of the city by works recently erected. The assessed value of property in 1873 was \$12,001,200; tax, \$300,768; value of city property, \$717,120 45; net debt, Jan. 1, 1874, \$807,860 16. Manchester is the seat of the state reform school, which occupies a brick building on the E. bank of the Merrimack, capable of accommodating 150 inmates. The public schools are in a flourishing condition, and in 1873 embraced 45 departments (1 high, 1 training or normal, 5 grammar, 6 middle, the rest primary or ungraded); number of teachers, 69; pupils en-

rolled, 3,779; average attendance, 2,284; cost of maintenance, \$49,062 17, including \$36,451 58 for teachers' wages; value of school property, \$249,675. Besides these, evening schools are maintained during a portion of the year, and there are several Catholic schools connected with the churches and convent. The latter also conducts an orphan asylum. The city library at the close of 1873 contained 17,672 volumes. Two daily and three weekly newspapers and a monthly periodical are published. The number of churches is 16, viz.: 2 Baptist, 1 Christian, 2 Congregational, 1 Episcopal, 2 Freewill Baptist, 2 Methodist, 3 Roman Catholic (1 French), 1 Second Advent, 1 Unitarian, and 1 Universalist.—The place was first settled near the falls about 1730, incorporated under the name of Derryfield in 1751, and named Manchester by act of the legislature in 1810. It received a city charter in 1846.

MANCHESTER, a town of Hartford co., Connecticut, on the Hartford, Providence, and Fishkill railroad, 5 m. E. of Hartford; pop. in 1870, 4,223. It contains extensive manufactories of book, government, and bank-note paper, of woollens and gingham, print works, a silk factory, several carriage factories, &c. A weekly newspaper is published. The paper mills are at North Manchester, 3 m. from which is South Manchester, which has grown up around the Cheney silk works, the most extensive in America. Dress silks and sewing silks are manufactured in immense quantities, by ingenious machinery, much of which was invented solely for use here. The cocoons are imported, and all the work of spinning, weaving, and dyeing is done here. The village was laid out by a landscape gardener; there are no fences, and pigs and poultry are prohibited. It is lighted with gas. There is a handsome public hall, with a library and reading room, and a free school to which the operatives are required to send their children.

MANCHESTER (anc. *Mancunium*), the most important manufacturing city in Great Britain, situated in the S. E. corner of Lancashire, on both sides of the river Irwell, 162 m. N. N. W. of London, and 31 m. E. by N. of Liverpool. It consists of Manchester proper, including several suburbs on the E. bank of the Irwell, and the borough of Salford on the W. bank; pop. in 1871, 475,990, of whom 351,189 were in Manchester city, and 124,801 in Salford (exclusive of suburban districts not lying within the municipal limits). The two towns, although having distinct municipal governments, constitute in all other respects one city. They are connected by eight bridges, among which are the Victoria, of a single arch, and Blackfriars, of three arches, of stone; the bridges of Strangeways and Springfield Lane, of iron; and the iron suspension bridge of Broughton. The streets are intersected by numerous canals, crossed by bridges, and are generally well paved and lighted; but the site is low, and notwithstanding the recent improved drainage and the introduction of an abundant supply of pure water, Manchester is still one of the most unhealthy places in the kingdom, the annual death rate being about 3·2 per cent. A portion of the place still presents an antiquated appearance, but there are many handsome streets, such as Market street, Portland place, Grosvenor square, Mosley street, George street, King street, Ardwick green, Salford crescent, &c. There are several handsome public parks and gardens, of which the most important are the botanical and horticultural gardens; the Peel park, on the Irwell, with an area of 32 acres; Victoria park, between London and Oxford roads, a space of 140 acres, covered with villas; the Queen's park, Phillips park, and Alexandra park, opened in 1870. The buildings devoted to business and manufactures have generally an imposing appearance. A marked change has been made of late years in the architectural character of the city. New squares have been laid out, new streets opened, and commercial buildings of a more ornamental appearance have been erected. In Manchester proper, in 1872, there were 168 places of worship, of which 8 were Baptist, 51 Church of England, 26 Independent, 45 Wesleyan and other Methodist, 12 Roman Catholic, 9 Presbyterian, and 5 Unitarian; including Salford, the whole number exceeds 200. The parish

church, commenced by Lord Delaware in 1422, and since 1847, when Manchester became a bishopric, the cathedral, is a highly ornamented Gothic structure, 216 ft. long and 120 ft. wide; but being built of a soft and mouldering stone, many repairs have been necessary, which give the structure a modern appearance; it has within a few years been restored at a great expense, and a new tower has been added to replace the old one, which was found incapable of restoration. There are several other handsome churches, among which are St. George's, in the suburb of Hulme, and the Roman Catholic cathedral of St. John, in Salford. Trinity church in Salford, the oldest in the borough, has a fine Gothic tower, and is interesting from the antique aspect of the interior. The old town hall, in King street, is in the Grecian style, and contains a hall 130 ft. long by 38 ft. wide, having its walls and dome covered by allegorical frescoes; but having become inadequate to the needs of the city, a new town hall, commenced in 1868, has been completed at a cost of £250,000. The new exchange is an Italian edifice, with a porch flanked by two towers, the great hall having a clear breadth of 120 ft. The corn exchange is an Ionic structure capable of holding 2,400 persons. The free-trade hall, somewhat irregular but large and effective, occupies the site of the old free-trade hall, and like it is noted in the history of Manchester as the place of several important political meetings. The new building, erected in 1856, occupies an area of 20,700 sq. ft.; it contains a hall 134 ft. long, 78

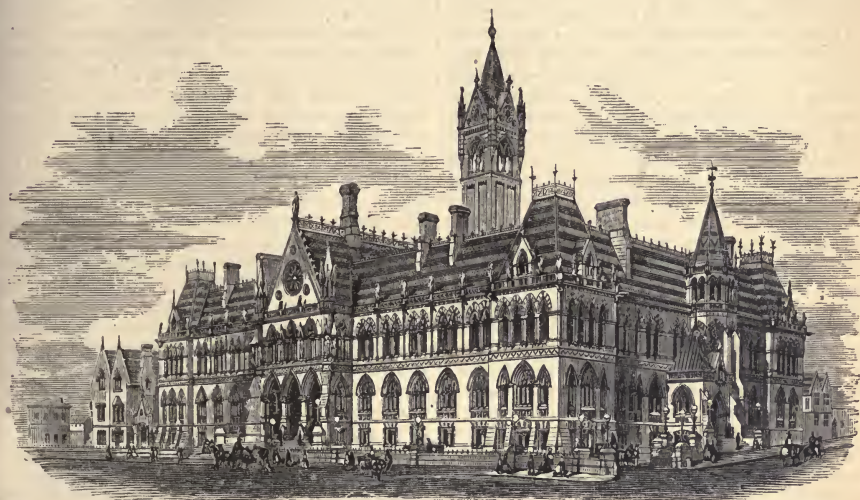


Royal Exchange, Manchester.

wide, and 52 high, and will hold 5,000 persons. The Salford town hall is one of the handsomest buildings in the town. The new royal exchange has a handsome front with Corinthian columns; its great room is 207 ft. long, 193 wide, and 80 high; the roof is supported by two rows of pillars, with a span of

nearly 100 ft. between them. The new assize courts were opened in 1864; the building is Gothic, 270 ft. long and 140 deep, with a tower 210 ft. high. The branch bank of England, opposite the town hall, is a fine structure, in the Grecian style, with a Doric colonnade. The royal infirmary, erected in 1755, is built on

three sides of a quadrangle, each with a portico supported by four fluted Ionic columns, the whole surrounded with grass borders and walks, with a sheet of water in front; it has an income of £9,000, and annually relieves more than 20,000 patients. Among the other notable public buildings are the court halls,



The Assize Courts, Manchester.

the jails, and the asylum for the blind and the deaf and dumb. In front of the new town hall is the Albert memorial, including a statue of Prince Albert. Two statues of Richard Cobden were erected in 1867, one in St. Anne's square, the other in Peel park. In front of the royal infirmary is a statue of Dalton; and there are also statues of Watt, Wellington, and Peel.—Among scientific, literary, and art associations are the royal Manchester institution, occupying buildings which cost £40,000, and devoted to the exhibition of paintings, lectures, &c.; the mechanics' institution, founded in 1825, for which a new edifice was erected in 1856, established for the instruction of the working classes, male and female, in the principles of the arts they practise and in other branches of useful knowledge; and natural history, botanical, horticultural, geological, statistical, and medical societies. The royal school of medicine and surgery, founded in 1824, has 80 to 100 students. The literary and philosophical society, established in 1781, has numbered many distinguished members, and has issued several volumes of valuable transactions. The Chetham society, established in 1843, has published 22 volumes of historical and literary remains. There are many public libraries. The free library, founded by voluntary subscription, and maintained by a municipal rate, has four branches, and is divided into two departments, reference and lending,

each having about 40,000 volumes. A free library of about 25,000 volumes is attached to Chetham's hospital, or the "College" as it is now simply called, an institution founded in 1651 by Humphrey Chetham, for the education of poor boys. Owens college was founded in 1846 by the munificence of a merchant of the city, who bequeathed for the purpose more than £100,000, which has of late been considerably enlarged by means of a fund raised by public subscription; it issues certificates to candidates for the degrees of bachelor of arts and bachelor of laws, to be conferred by the university of London. The Lancashire Independent college was established by the Independents as a theological seminary, and will accommodate 50 students. Manchester New college, Unitarian, founded in 1786, was removed to London in 1857; and in 1865 Memorial Hall was erected in Manchester as a Unitarian college. There is a free grammar school founded by Hugh Oldham, bishop of Exeter, in 1515-'25. The Jubilee school trains pupils for domestic service.—Manchester is supplied with water from a "gathering ground," about 24 m. distant, of nearly 20,000 acres. The reservoirs form a series of 10 artificial lakes of a capacity of 600,000,000 cubic ft. The pure water only is supplied to the city, the turbid water being collected in separate reservoirs and used for mill purposes. The water is conveyed in aqueducts 12 m. to Godley, thence to

two reservoirs at Denton, and thence 4 m. to Manchester. The works are capable of furnishing 40,000,000 gallons daily, and their cost was about £1,050,000. Manchester is the centre of a great system of canals, and has railway communication with nearly all parts of England. The Liverpool and Manchester line was the first railway on which was attempted the practical application of steam power for the transportation of passengers.—The borough of Manchester, comprising besides the city itself the townships of Charlton-upon-Medlock, Hulme, Ardwick, and Chetham, with the extra-parochial district of Beswick (total pop. in 1871, 379,374), was incorporated by royal charter in October, 1838. The management of its local affairs is intrusted to a town council of 64 members, styled respectively mayor, aldermen, and councillors, who appoint from their body committees for the transaction of public business, who report their proceedings for approval at the general meeting of the council. This council have introduced many valuable improvements, notable among which are the water works; it is anticipated that when these are fully completed, the sale of water for the purposes of trade will be sufficient to defray the entire expense, leaving free that required for domestic purposes. The gas works are also under control of the council, and notwithstanding the price of gas has been frequently reduced, there is a profit of about £35,000 a year, which is expended in improving and widening the streets. In 1846 the town council purchased from Sir Oswald Mosley his manorial rights for £200,000, of which £195,000 was left on mortgage at an interest of 3½ per cent.; the income from this property now amounts to £16,000 a year. The borough formerly returned two members to parliament, but by the reform act of 1867 the number was raised to three. The borough of Salford, constituted by the reform act of 1832, returns two members to parliament. It is governed by a mayor, 8 aldermen, and 24 councillors.—Manchester has from a very remote period been connected with industry and trade; but its present great importance is specially due to the magnitude of its cotton manufactures, the greatest in the world. It is mentioned as having maintained a trade with the Greeks of Massilia (Marseilles). In 1552 an act was passed for the better manufacture of "Manchester cottons;" and in 1650 its manufactures ranked among the first in extent and importance, and its people were described as "the most industrious in the northern parts of the kingdom." The inadequate supply of cotton goods about the middle of the last century stimulated efforts for increasing the means of production; and the machines successively invented by Leigh, Hughes, Arkwright, Hargreaves, and others, had their efficiency vastly increased by the steam engine of Watt. The value of the exports of the cotton industry in 1780 was £355,060; it rose in 1781 to £1,101,457, and in

1856 it had reached upward of £38,000,000. The imports of raw cotton in 1751 were to the amount of 2,976,610 lbs.; in 1780, upward of 6,700,000; in 1800, 56,000,000; and in 1860, 1,115,890,608. In 1857 an advance in the price of American cotton caused the formation in Manchester of the cotton supply association, to procure the staple from other countries. After the outbreak of the civil war in the United States, Manchester suffered severely from the cotton famine, and in 1862 more than one third of the operatives were thrown out of employment. At the close of the war there was a renewal of activity, though the import of United States cotton in 1870 was but little more than half the supply from the same source in 1860. Sole reliance, however, is not now placed on the American supply. During the war the machinery of many of the mills was altered to adapt it to the fibre from India and Egypt, and these mills still continue to use to a large extent the cotton from those countries. Connected with the cotton manufacture are many important and extensive branches of industry, such as bleaching, printing, and dyeing works, manufactures of the various materials employed in those processes, and particularly the great establishments for the construction of steam engines and machinery. It is also the chief market in the world for cotton yarn or thread, the supply of which passes through the hands of numerous resident foreign merchants, who export it to their respective countries, giving to Manchester in this respect a character quite unique among inland cities. The manufacture of silk and silk goods, and of mixed cotton and silk fabrics, is also largely carried on. The following table, furnished by the inspector of factories, presents the statistics of the manufacturing industry in 1871:

MANUFACTURES.	No. of works.	Steam power.	Total No. of persons employed.
Textile fabrics and clothing:			
Cotton factories.....	111	16,564	20,346
Worsted ".....	13	671	2,538
Silk ".....	11	185	1,990
Bleaching and dyeing works...	26	769	2,281
Warehouses.....	30	1,218	1,236
Calendering and finishing works	161	1,528	5,490
Millinery, mantle, stay, corset, and dress making.....	346	82	3,334
Tailors and clothiers.....	213	...	1,914
Miscellaneous.....	417	772	4,476
Total.....	1,383	21,739	43,595
Metal manufactures:			
Manufacture of machinery.....	88	2,750	8,981
Miscellaneous.....	282	942	8,665
Total.....	365	8,692	12,646
Leather manufactures.....	74	118	677
Chemical works:			
Glass making.....	13	113	1,348
Miscellaneous.....	15	73	224
Total.....	28	186	1,572
Manufactures connected with food.....	40	332	604

MANUFACTURES.	No. of works.	Steam power.	Total No. of persons employed.
Manufactures connected with building, &c.:			
Builders.....	52	161	1,185
Cabinet and furniture makers..	99	106	1,188
Miscellaneous.....	353	533	2,069
Total.....	509	800	4,427
Paper manufactures.....	23	191	581
Miscellaneous manufactures:			
Letterpress printing.....	101	221	2,243
Coach building.....	18	91	1,051
India rubber and gutta percha.	4	611	840
Others.....	288	454	4,999
Total.....	411	1,407	9,138
Grand total.....	2,738	23,515	73,235

—The site of Manchester is mentioned as a chief station of the druids, who had there an altar called Meyne. In A. D. 500 it was an unfrequented woodland. In 620 it was taken by Edwin, king of Northumbria, and shortly after occupied by a colony of Angles. It then passed to the Danes, who about 920 were expelled by the king of Mercia. The charter conferring the privileges of a borough was granted in 1301. Manchester cotton is first mentioned in 1352, by which was meant, however, a coarse woollen cloth woven from unprepared fleece. In 1579 the manor was sold to John Lacye, a London cloth-worker, for £3,000, and resold in 1596 to Sir Nicholas Mosley for £3,500. At the time of the civil war it was distinguished for active industry, and suffered much from both parties. On Jan. 8, 1819, a great radical meeting was held at St. Peter's field; and another great meeting, attended by 60,000 persons, on Aug. 16 of the same year, was dispersed by the yeomanry cavalry, eight persons being killed. In 1857 an exhibition was held from May to October for the display of the art treasures of the kingdom. Among the objects exhibited were 1,115 paintings, 969 water-color drawings, 160 specimens of modern sculpture, 260 original sketches and drawings by the old masters, and a museum of ornamental art comprising 17,000 choice specimens.

MANCHINEEL (*hippomane mancinella*), a poisonous evergreen tree growing wild in the West India islands, along the shores of the Caribbean sea, and in southern Florida. It is of the natural order *euphorbiaceæ*; and the name *hippomane* (Gr. ἵππος, horse, and *μαίνεσθαι*, to be mad) is given to the genus from the supposed maddening effect of its juice upon horses. The manchineel tree grows to the height of 40 or 50 ft.; it has a smooth brownish bark, and short and thick branches. The leaves are about 3 in. long and half as wide, with two glands at the junction of the blade with the short foot-stalks; the flowers grow in short thick spikes at the end of the branches; the fertile flowers are solitary at the base of the spikes, and the staminate ones in small clusters at its apex;

both kinds are obscure and without petals. The fruit when ripe is of a yellow color, and resembles an apple in appearance; hence it is called *manzanillo* (little apple), a name that in Spanish American countries is applied to several plants bearing fruit like an apple, or the leaves and flowers of which have an apple-like odor. Some early accounts state that this tree is more deadly poisonous than the upas, asserting that grass would not grow beneath it, that death would follow sleeping under its shade, and that a drop of its juice falling upon the skin had the same effect as the application of red-hot iron. While the milky juice of the tree is highly poisonous, investigations have shown the earlier reports to be greatly exaggerated, and that, like our poison sumach, it affects some persons more seriously than others. Those who, not knowing its character, have inadvertently tasted of the fruit, have suffered from severe blistering of the lips. The



Manchineel.

juice as well as the smoke from the burning wood produces temporary blindness. Berthold Seemann, the botanist, was blind after gathering specimens, and a boat's crew of his ship, the *Herald*, were blind for several days from having used some of the wood in making a fire. On account of the beauty of the brown and white wood when polished, it is much used for cabinet work. It is said that before striking the axe into the trees the workmen take care to light fires around them in order to thicken the juice and drive off the volatile poisonous quality; and cabinet makers also when working it protect their faces with veils from the poisonous effects of the saw dust and exhalations from the wood.

MANCHOORIA. See MANTCHOORIA.

MANCINI, a Roman family, founded in the 14th century by Pietro Omni-Santi, surnamed Mancini dei Luci. Among his descendants was Michele Lorenzo Mancini, a brother of Cardinal Francesco Maria Mancini, who mar-

ried in 1634 a sister of Cardinal Mazarin. His daughters became prominent, according to Michelet, as "a battalion of Mazarin's nieces, brought up under the cynical influence of Christina of Sweden, and for whom one of their brothers, the duke de Nevers, had a more than brotherly love." **I. Laure** (1635-57), the least dissolute of the five sisters, though her beauty captivated many persons, among whom was the young Louis XIV., married the duke de Mercœur. One of her two sons, the duke de Vendôme, became a famous warrior. **II. Olympe** (1639-1708), called on account of her dark complexion and mischievous disposition "black soul and black face," was a mistress of Louis XIV. Her uncle found a husband for her (1657) in Eugène de Carignan, of the house of Savoy, who was on his mother's side a French prince of the blood royal, and for whom the cardinal revived the title of count de Soissons. Though superseded for a time in the king's favor by her sister Marie, she soon regained her ascendancy, and they lived openly together. Her husband died suddenly in 1673, and it was suspected that she poisoned him. In 1679 she was compromised by the revelations of the poisoner Voisin. But she was considered to have been innocent as regarded the death of her husband, to whom she had borne eight children, and nothing was proved against her in connection with Voisin. She was however prosecuted by Louvois and fled to Brussels, where she barely escaped being mobbed, and spent the rest of her life in various countries. While in Spain, where she met her fugitive sister Marie, King Charles II. attributed the sudden and premature death of his wife, Louise of France, to the frequent and clandestine visits which Olympe had paid to the queen in her illness, and to some milk which she had prepared for her shortly before her death. The celebrated soldier Prince Eugene of Savoy was one of her five sons, and she had three daughters. **III. Marie** (1640-1715) excited the passion of Louis XIV. to such an extent that he would have married her if the cardinal had not sent her to a convent, while he planned the king's union with Maria Theresa, and Marie's marriage (1661) with the Roman prince and constable Colonna, with a dowry consisting of an annuity of 100,000 livres. She bore him several children, but he was faithless, and she furtively left Rome together with her sister Hortense, both reaching Marseilles in male attire in a destitute condition. Louis XIV. had her removed to the abbaye du Lis, and subsequently she led a wandering and adventurous life. It is not known where she died. Michelet describes her as sombre-looking, with large glittering eyes. She was the least attractive of the sisters. **IV. Hortense** (1646-99), the prettiest of them all, courted by Charles II. of England, Turenne, and Charles de Lorraine, was married by her uncle to Armand de la Porte, marquis de la Meilleraye. The cardinal died in March, 1661, a month

after his niece's marriage with the marquis, who assumed the name of duke of Mazarin. His jealousy of the king and of other persons bordered on insanity. She finally fled with her brother, the duke of Nevers, and her reputed lover, the chevalier de Rohan, to the house of one of her former admirers, Charles de Lorraine, at Nancy, and thence to the court of Charles Emanuel of Savoy at Chambéry, where she spent three years. On his death in 1675 she was immediately expelled by his widow. After an adventurous expedition to the Netherlands and Germany, she paid a visit to Charles II., who was still in love with her, and added an annuity of 4,000 livres to that of 20,000 which had been granted to her by Louis XIV. He also assigned to her a wing of St. James's palace, where gambling and dissipation became the order of the day. The Swedish count Bannier, another lover of hers, was killed in a duel by her nephew, the chevalier de Soissons, who, though a mere boy, was madly in love with his aunt. After the revolution of 1688 her pension was cut off, and she was accused of complicity in Jacobite plots. But William III. restored to her one half of her former English pension, and permitted her to remain in England, and she ended her life at Chelsea. Lafontaine celebrated her in verses, giving her credit not only for all imaginable fine qualities of person, mind, and heart, but also for being adored from one end of the world to the other, and to such an extent as to create jealousy between England and France. **V. Marie Anne** (1649-1714) reached Paris only in 1655, much later than her sisters. She was also prosecuted as an associate of the poisoner Voisin, and did not live long with her husband, Maurice Godefroi de la Tour, duke de Bouillon, a nephew of Turenne, whom she had married in 1662. She retired to the palace of Château-Thierry, where she became the patroness of Lafontaine. Subsequently, after having rejoined her husband in Paris, she made her home a literary centre, with Molière and the aged Corneille among the habitués. Like her father and all her sisters, she dabbled in necromancy as well as in poison, and was obliged to leave Paris in 1680. She lived for eight years with her sister the duchess of Mazarin in England; and after spending two years in Venice and Rome she was permitted in 1690 to return to Paris, where her society was courted to the last by eminent men of letters.

MANCINI. I. Pasquale, an Italian statesman, born in Naples about 1815. He took his degree at the university of his native city, where he became professor of jurisprudence. In 1848 he was a member of the Neapolitan parliament, and drew up the protest against the king's violent proceedings of May 15. To escape from the vengeance of the king he fled to Turin, where he was appointed professor of international law, which gave him an opportunity to urge the rights of nationalities; he

was also elected to the Sardinian chamber. In 1860 he became minister of justice and religion at Naples, and was a leader of the liberal party in the first Italian parliament, which met in 1861. In 1862 he was for a time minister of education in the cabinet of Rattazzi. He has published *Diritto internazionale* (Naples, 1873). II. **Laura Beatrice Oliva**, an Italian poetess, wife of the preceding, born in Naples in 1823. She devoted the early part of her life to her invalid father, to whom she was indebted for her education. In 1840 she married against the wish of her relatives, and wrote a play entitled *Ines* founded upon the romantic circumstances of this alliance, which was performed in Florence in 1845. In 1846 appeared her poem *Colombo al convento della Rabida*, and a volume of miscellaneous poetry. In 1851 she addressed a poem to Mr. Gladstone in gratitude for his revelations in regard to the Neapolitan government; and one of her finest poems was elicited by the death of Gioberti (*L'Italia sulla tomba di Vincenzo Gioberti*, Turin, 1853). Upon the establishment of the kingdom of Italy she composed several poems for patriotic celebrations.

MANCO CAPAC. I. The mythical ancestor of the incas of Peru. (See **PERU**, and **QUICHUAS**.)

II. Inca of Peru, killed in 1544. He was the second son of the inca Huayna Capac, the conqueror of Quito, who died shortly before the arrival of Pizarro, dividing his kingdom between his legitimate successor Huascar and a younger son Atahualpa. The latter, after having made war upon Huascar and put him to death, was himself captured and executed in 1533 by Pizarro, who then set up Toparca, a brother of his victim, as a nominal sovereign, under whose name the conquerors might themselves direct the government. Toparca died within the year, and shortly afterward Manco Capac appeared in the Spanish camp to announce his pretensions to the throne and claim Pizarro's protection. The conqueror received him cordially, and made it his first care after the taking of Cuzco to place him on the throne. After in vain petitioning for power to exercise the sovereignty, he withdrew secretly from Cuzco, but was overtaken, brought back, and imprisoned. Again escaping, he roused the whole nation to arms, and appeared before Cuzco in February, 1536, with a host of Indians who covered the surrounding hills. He destroyed a large part of the city by fire, and reduced the Spaniards to extremities; but after the siege had lasted more than five months, he had to draw off most of his followers on account of the scarcity of food, and retired to the fortress of Tambo in the valley of the Yucay. Defeated here by Almagro, and forsaken by most of his warriors, he fled to the Andes, and for several years remained a terror to the Spaniards, hovering over their towns, lying in ambush on the highways, sallying forth as occasion offered at the head of a few followers, always eluding pursuit in the wilds of the Cordilleras, and in

the event of civil war among the foreigners throwing his weight into the weaker scale in order to prolong their contests. Pizarro attempted to negotiate with him, and sent him rich presents by an African slave. The negro was murdered on the way by some of Manco's men; and Pizarro in revenge caused one of the monarch's wives to be tied naked to a tree, scourged, and shot to death with arrows. The Spanish rulers who succeeded Pizarro, down to Blasco Nunez, bore orders from the crown to conciliate the formidable chief, but he refused all offers of accommodation. He was killed by a party of Spaniards belonging to the younger Almagro's faction, who on the defeat of their leader had taken refuge in the Peruvian camp. They were in turn massacred by the Indians.

MANDAMUS, the name of a remedial writ, belonging to a once extensive class of precepts, which bore the generic name of mandamus. They derived their name from the significant word of the mandatory clause, which, while the writs were framed in Latin, ran: *Nos igitur tibi mandamus*, &c., "We therefore command you." Their origin is referred to that clause of Magna Charta which declares that to no man will the king refuse or delay justice: *Nulli negabimus aut differemus justitiam vel rectum*. At a very early period, the injunction was in form nothing but a letter from the sovereign. Subsequently it became a parliamentary writ, and issued on petition from the king and his council. Later the king's bench took jurisdiction, which in the recent judicial changes in England has been transferred to the supreme court. The writ is directed to persons, corporations, or courts of inferior jurisdiction, and requires them to do some specific act which belongs to their official duty, or which exact justice demands. In this country the power to grant it is vested in the supreme judicial authority of the state, but in some states, also, in inferior courts. Not only does it form a branch of that general supervisory control which the sovereign power must possess over tribunals, magistrates, and all indeed who in any sense are invested with public functions; but also, as it was originally contrived to prevent failure of justice and to remedy defects of police, it is to be awarded in cases for which the law affords no specific and adequate remedy, yet where justice requires that there should be one. By the judiciary act of 1793 the United States supreme court received power to issue writs of mandamus in cases warranted by the principles and usages of law "to any courts appointed or persons holding office under the authority of the United States;" but in *Marbury v. Madison*, 1 Cranch, 137, the latter clause was held to be unconstitutional and void, and the supreme court refused to grant the writ to compel the secretary of state to deliver a civil commission alleged to be illegally withheld by him. Circuit courts, too, were authorized to issue the writ

when necessary for the exercise of their jurisdiction. The award of the writ is generally a matter of judicial discretion. He who seeks this remedy must show that he is innocent of laches, that he has a clear right in the premises, that there has been a distinct refusal to do that which the petitioner would compel, and finally that he has in the ordinary processes of law no adequate remedy. The most common practice is for the court in the first instance to issue a writ commanding to be done that which is prayed for, or that the respondent show cause why it should not be done; or an order may issue in the first instance that the respondent show cause why a peremptory mandamus should not issue. In either case the defendant makes answer, and if the petitioner, who is usually called relator, is satisfied with the statement of facts in the answer, he will demur thereto, and the question will thus be referred to the court on an issue of law. If the relator is dissatisfied with the statement of facts in the answer, he may join issue thereon, and this issue of fact will be tried as the court may direct. If either issue is decided in favor of the relator, a peremptory mandamus is awarded. In a very clear case the peremptory writ may issue in the first instance. When directed to a court, the writ merely sets such court in motion; it bids it exercise a power which is vested in it. It does not presume to revise the decision of the inferior tribunal upon a question either of fact or law addressed to its judgment. As examples of this jurisdiction, mandamus has been granted to compel the sealing of a bill of exceptions or its amendment according to the truth of the case; or, at suit of a defendant, to require the inferior court to enter judgment upon a verdict, in the regular course of proceedings, in order to enable the defeated party to bring his writ of error. But the writ does not lie to control courts in respect to matters of practice under their rules, where their authority is discretionary. Mandamus often issues to commissioners of highways and supervisors of counties, commanding them to perform the peculiar duties of their office; ordering them, for example, to open a road regularly laid out; to estimate the damages caused to landowners thereby, or to levy a tax as they were required by law to do for the payment of damages caused by laying out a highway. Corporations, too, are often commanded by this process to do what their constituent acts require. Thus railway corporations have been compelled to pursue, in crossing rivers, the mode prescribed in their charters, and have been forbidden to obstruct navigation by the location of their track. Retiring public officers may also be compelled by this writ to deliver official books and papers to their successors, and corporations to admit members to their privileges, to restore a member irregularly disfranchised, and to allow directors, and in proper cases other corporators, to have inspection of books. It is a common

process to compel the performance of public duties by public officers, but in such cases the attorney general or other public prosecuting officer should be relator, and a private citizen would not be allowed to take action except where some special and peculiar right of his own was involved in the performance of the public duty. The action of the executive, however, in the performance of his peculiar duties, is not to be controlled by this writ.

MANDANS, an Indian tribe of the Dakota family, dwelling on the Upper Missouri. According to their traditions, they came from under the earth, where they lived near a subterranean lake. They ascended by means of a grape vine, which a heavy woman broke, so that part of the tribe were left below. About 1772 they are said to have resided 1,500 m. from the mouth of the Missouri, in nine villages, encircled with earth walls, two on the east and seven west of the river. The Sioux soon after drove the eastern villages to the Rickaree or Arickaree country, further up the river, and they emigrated again before those on the west followed them. Lewis and Clarke found them 1,600 m. up the river, in two villages, one on each side of the river, and as they were friendly built Fort Mandan near them. By the advice of the explorers they made peace with most of the neighboring tribes. In 1822 they were estimated at 1,250 in number, and though some placed the population much higher, it did not probably exceed 2,500. They made a treaty with Gen. Atkinson and the agent O'Fallon, July 30, 1825, recognizing the authority of the United States, and making peace. They continued to lose severely by their wars with the Sioux, who to this day pursue them with unrelenting hatred, parties under White Bonnet having twice attempted to destroy their village in 1870. In 1882 they dwelt at Fort Clarke, near the mouth of Knife river, and were supposed to number 2,000. In 1887 the smallpox broke out among them, and reduced the tribe to 145 souls in all, chiefly women and children. The survivors took refuge with the Rickarees. They are often spoken of as having been entirely swept away; but they gradually regained numbers, and always maintained a distinct tribal organization. In 1845 they removed to their present abode. In 1850 they numbered 50 lodges and 150 souls, and in 1852 had increased to 385. They are now (1874) with the Rickarees and Minnetarees at Fort Berthold, Dakota territory, on the left bank of the Missouri, in lat. 47° 34' N., lon. 101° 50' W. An executive order of April 12, 1870, set apart a reservation of 8,640,000 acres for the three tribes, in north-western Dakota and eastern Montana, extending to the Yellowstone and Powder rivers. Under a treaty made July 27, 1866, government appropriates \$75,000 a year for the three tribes. The Mandans were reported in 1873 as numbering 479. Though always friendly, living in a permanent village, they have had no mission-

aries and very feeble attempts at a school. The Mandans live partly by agriculture, having 100 acres in corn and potatoes, and possessing 150 horses, but they have no cattle or proper implements. They extend their hunts west to the Rocky mountains, north to the British line, and south to the Black hills.—The Mandans are of lighter complexion than many of the tribes, and gray hair, even in young persons, is common. This, and a story based on very vague hearsay that Welsh soldiers at Fort Chartres conversed in their language with the Mandans, has led to many attempts to trace their origin to Madoc's supposed Welsh colony. Their houses are of wood; some of them are polygonal in shape, with an excavated cellar in the centre. The wooden frame is covered with earth, and the roof is a favorite resort. Quadrangular log cabins are also used. Besides pipes, arrows, bows, &c., they make matting of wild rushes, baskets of willow bark woven in different and intricate colored patterns, large beads, and a very substantial black pottery; some of the vessels hold three gallons and are capable of standing great heat. Their canoes are made of skins. They place the dead, wrapped in skins, on scaffolds, and when these fall they gather the skulls and place them in circles. They have a strange annual religious ceremony, relating to the great canoe and Numokhmuckanah, the first or only man. They have many peculiar dances and a fearfully cruel initiation rite for young warriors.

MANDATE, a law term derived from the Roman civil law. It may be defined as a bailment (delivery) of a chattel or chattels to a person who is to do something with or about the things bailed, entirely without compensation. The essential element of the contract lies in the fact that there is not paid or promised, in law or in fact, any compensation whatever for the service to be rendered. The person delivering the chattels is called a mandator; and the person receiving them and undertaking the service is called a mandatary. As it must be a service or an act, the whole benefit of which rests with the mandator, this, by the ordinary principles of bailment, determines the amount of care to which the mandatary is bound, and the degree of negligence for which he is answerable. For negligence in a bailee has in law three degrees: slight negligence, which makes the bailee responsible where the bailment was wholly for his benefit; ordinary negligence, for which he is responsible if the bailment be for the benefit of both parties; and gross negligence, for which only the bailee is responsible where the contract is for the exclusive benefit of the bailor. And as it is not a mandate if the bailee derives any benefit whatever from the service, it follows that a mandatary is responsible for loss of or for injury to the thing delivered to him, only when it is caused by his gross negligence.—There is no especial form for the contract of mandate; it may be in writing or by word only, and made

very solemnly or in the simplest way; in either case the law is the same. The mandator may recall the thing delivered at any time, and so rescind the contract. But if the nature of the contract be such that a mandatary has rendered the service in part, and will himself suffer detriment if it be not completed, the mandator cannot now rescind it without providing adequate indemnity to the mandatary. When the contract is lawfully dissolved, the chattel must be restored to the mandator; but if indemnity be due to the mandatary, he would have a lien on the chattel to secure it. So, too, the contract would be dissolved by the death of the mandator or of the mandatary, or by any change in the state of the parties which from its nature should recall it, as by insolvency of either party, or insanity, or the marriage of a woman, or the sale of the property, or the termination of a guardianship on which the mandate rested. But in all these cases there must be the same exception as to a service partially rendered. So, too, it is believed that the mandatary may at his own pleasure terminate the contract; and as he may do this at any time, he may do it before he has begun to perform the service at all. But this very question has been more frequently and more elaborately discussed than any or all others which have arisen out of the contract of mandate.—Banks and bankers are so far mandataries, that they receive notes for collection, and render, or engage to render, by agreement or by mercantile usage, these and similar services without any especial or specific compensation. But it is understood that they do this as a part of their business, and for the general and indirect benefit they derive from doing it; and this is undoubtedly consideration enough to make them liable for any injury to their customer caused by their negligence; and it is sufficient to make them liable that their negligence was ordinary, or consisted in the want of common care.—We have seen that a mandatary is, by law, liable only for gross negligence. But it is a voluntary contract, and the parties may vary it in any way, and make it more or less stringent, at their pleasure. Where the parties enter into no specific stipulations, there the law sometimes varies their liabilities in accordance with the particular circumstances of the case. Thus, it is an obvious principle that the mandator has no right to require any more skill or care than he has reason to expect. If an owner of a valuable chronometer carry it for repair to an ordinary watchmaker who does no business of this kind, and the instrument be injured in his hand because no more care and no better skill were applied to it than would suffice for ordinary watches, the owner has no one to blame but himself; unless he can show that the watchmaker especially undertook to be able to do the work required, and that the bailor had no means of knowing his incompetency. On the other hand, if the owner intrusted his instrument to a person who was

known to deal with those of like kind, who professed this as his business, and expressly or by implication asserted himself to possess sufficient skill, this person would then be liable, as for gross negligence, if he did not possess the requisite skill, or did possess it but did not make use of it, although he was strictly a mandatary, and had undertaken the work gratuitously. Here, however, a distinction must be taken. If a workman who is paid for his service asserts himself to have sufficient skill, he is liable for injury resulting from the want of that skill, although he does his best. But if he is not paid for his service and makes the same assertion, he is now not liable merely for the want of it unless he made the assertion fraudulently and knowing its falsehood; but, however honest, he is liable if, besides a want of skill, he has been guilty of negligence.—Mandates in the civil law were the orders of the high functionaries, as the consuls and proconsuls, and afterward the emperors, to subordi-

nate officers, to instruct them as to the conduct they should pursue, either in general or in particular cases. At common law, the word mandate in a corresponding sense can hardly be said to be known. But it is sometimes used to signify an official command issued by a court, or a magistrate, or any tribunal having authority, in the form of a writ or precept. It is generally, if not always, confined to commands issued to an inferior court, to confirm or set aside a judgment, as by the supreme court of the United States to a circuit court, or to a proper officer, to enforce or execute a judgment, decree, or order. When the command is issued to an individual who is a party before the tribunal, it is commonly known as an injunction, prohibition, or the like.

MANDELAY, Mandalay, or Pattawapura, the present capital of the kingdom of Burmah, a little N. of the former capital Amarapura, 3 m. from the Irrawaddy river, and 350 m. N. of Rangoon; pop. about 90,000. In 1856 its site



Mandalay.

was occupied by cultivated fields; but after the royal determination to select a new capital, its erection was carried forward so rapidly that by July, 1857, it was ready for the reception of the court. The city is laid out in three parallelograms, one within another, of which only the two inner are walled. Within the inmost is the palace, which is also defended by high palisades, and surrounded by courtyards, gardens, and pools. Within this square are also the various offices of government. The second enclosure contains the houses of the civil and military officers and the soldiers' quarters, and is laid out in wide streets crossing at right angles. It is surrounded by a high wall flanked with strong towers, with four massive gates, which are locked at night. There is also a

deep ditch. A wide interval separates this quarter from the outer city, which is occupied by the merchants, mechanics, &c. The fortifications are massive, and the palace, pagodas, and cloisters are brilliant with color and gold; but the city still resembles the encampment of a tribe of nomads, and many of the dwellings are little more permanent than tents. Water is obtained from the river by a canal, which to obtain a proper level has to be carried a distance of 16 m. Postal communication with Rangoon is kept up by dak boats, which make the voyage in eight days.

MANDEVILLE, Sir John, an English author, born in St. Albans about 1800, died in Liège, Nov. 17, 1872. He was a proficient in theology, natural philosophy, and medicine, and even

practised as a physician for some time. In 1322 he proceeded to the East, visited the holy places in Palestine, being favored by the sultan of Egypt, and travelled in Armenia, Persia, India, Tartary, and northern China (Cathay). He returned to England about 1355, and wrote a narrative of his travels and adventures, first in Latin, and afterward in French and in English, which he dedicated to Edward III. This work is a singular mixture of fact and fable, a monument at once of the author's candor and credulity. The earliest edition of it is that of Wynkin de Worde (Westminster, 1499), and the best of the old English editions is that of 1725. A new edition was published by J. O. Halliwell (London, 1839).

MANDINGO, a country in W. Africa, bounded N. by Kaarta, E. by Bambarra, S. by the Kong mountains, and W. by Senegambia, lying between lat. 8° and 15° N., and lon. 8° and 12° W. Much of this region is a high table land, and contains the sources of the Senegal and the Niger. Iron is abundant in the mountains, and gold dust is found in the rivers. The country is divided into a number of small states, each of which is nearly independent of the others. The most considerable of these states are Bambook and Kankan.—The Mandingos are remarkable for their industry and energy. They are mostly Mohammedans. The principal trade of that part of W. Africa which lies between the equator and the great desert is in their hands. They are shrewd merchants, industrious agriculturists, and breeders of cattle, sheep, and goats. They are black in color, tall and well shaped, with regular features and woolly hair. They have been called the Hindoos of Africa. They are amiable and hospitable, imaginative, credulous, truthful, and fond of music, dancing, and poetry. They are adventurous travellers, extending their commercial journeys over the greater part of Africa. They trade chiefly in gold dust, ivory, and slaves. Polygamy is practised, and each wife has a separate hut. Their language is the richest of the negro tongues, is widely spread, and is written in Arabic characters. The Mandingos are the most numerous race of W. Africa, and have spread themselves to a great distance from their original seat, being found all over the valleys of the Gambia, Senegal, and Niger.

MANDRAGORA. See **MANDRAKE**.

MANDRAKE (*mandragora officinarum*), a stemless plant, with lanceolate leaves, concealing beneath them several pale violet-colored flowers, and having a large, forked, fleshy, perennial root. It grows spontaneously in the south of Europe. The plant belongs to the natural order *solanaceæ*, which comprises many poisonous species. Its large root is often divided into two or three forks, causing it to be likened to the shape of the human body, a circumstance which in old time gave it the reputation of being endowed with animal feelings; and there are fabulous stories of its uttering shrieks when torn from the earth. The works

of the early herbalists have curious accounts of the supposed virtues of this plant, of which they distinguished male and female varieties. According to Josephus, the collecting of man-



Mandragora officinarum.

drake was no easy matter; after the earth had been well dug from around the root a dog was tied to it, and when the animal tried to follow its master, its struggles pulled up the root; the dog died immediately, a fate which would have befallen the man had he pulled it. Sibthorp (*Flora Græca*, London, 1806-'40) says that the young Greeks wear small pieces of the root about them to serve as love charms; and among the ancients it was held in high repute for philters. The qualities of the mandrake are acro-narcotic, purgative, and aphrodisiac. According to Lindley, Dr. T. H. Silvester has shown that the root was formerly used in the same way as chloroform and other anæsthetic agents now are. The mandrake of the Old Testament (Gen. xxx. and Canticles vii.) was thought, according to some commentators, to have the power of removing barrenness.—The American mandrake, also called May apple, is *podophyllum peltatum*, a plant belonging to a very different family, and now largely employed in medicine. (See **PODOPHYLLUM**.)

MANDRILL. See **BABOON**.

MANES. See **MANICHEANS**.

MANES, in Roman mythology, the souls of the departed, who were generally recognized as gods and propitiated by sacrifices at certain seasons called *feriæ denicales*, and more particularly at an annual festival kept on Feb. 19 under the name of *feralia* or *parentalia*, when each person made offerings to the souls of his deceased parents and benefactors. The manes were believed to have power only by night.

MANETHO, an Egyptian historian, who flourished in the reign of Ptolemy Soter, at the beginning of the 3d century B. C. He was a priest of Sebennytus in Lower Egypt, and wrote in Greek a work on the religion and an-

other on the history of his country, the title of the former being *Τῶν Φυσικῶν Ἐπιτομή*, and of the latter *Αἰγυπτιακά*. Both books are lost, but numerous fragments have been preserved by Josephus, Julius Africanus, Eusebius, and by Syncellus, who compiled from the two latter. The list of the Egyptian dynasties, as preserved in the Armenian version of Eusebius, is the most valuable remnant of Manetho's history, the dates of which appear to have been derived from genuine documents, including the sacred books of the Egyptian priests. Attacked as a fabulist by various critics, Manetho has found zealous defenders among the most distinguished Egyptologists, and the recent discoveries in hieroglyphic archaeology have vindicated his authority (see *EGYPT*, vol. vi., pp. 458-'9); but parts of the fragments are now generally acknowledged to be spurious, as is the astrological poem *Ἀποτελεσματικὴ*, which bears his name, but is of late date.—The best critical editions of the fragments of Manetho are by Fruin (Leyden, 1847) and Müller, in vol. ii. of the *Fragmenta Historicorum Græcorum* (Paris, 1848).

MANFRED, prince of Tarentum, king of the Two Sicilies, natural son of the emperor Frederick II. and of Blanca, a daughter of Count Lanza of Lombardy, born in Sicily about 1233, fell in the battle of Benevento, Feb. 26, 1266. At his father's death in 1250 he was appointed regent in Italy during the absence of his half brother Conrad IV., the legitimate heir. Pope Innocent IV. immediately excommunicated him, declaring that the house of Swabia had ceased to rule over Sicily, because Frederick II. had died under the papal ban. Insurrections were excited in Capua, Naples, and other cities, but Manfred reduced most of the rebels, advanced to meet Conrad at Pescara, delivered the government into his hands, and aided him in completely suppressing the revolt. He was, however, removed from any part in the administration, his principality of Tarentum was taxed, and the Lanzias were exiled from it. Conrad died in 1254, leaving the crown to his infant son Conradin, and Manfred was again called to the regency. Innocent IV. renewed his opposition to him, supported by the Guelph party in the Two Sicilies, forced him to agree to hold his possessions as an immediate fief of the holy see, and had demanded from him an oath of entire submission, when he made his escape to the Saracens at Lucera. Aided by them, he defeated the papal troops at Foggia, recovered Apulia, and after the death of Innocent was recognized king of the Two Sicilies, and crowned at Palermo, Aug. 11, 1258, a report of Conradin's death in Germany being at that time spread through Italy. This report was immediately contradicted by envoys, but Manfred refused to resign the crown, and his bravery, handsome person, accomplishments, and success made the people willingly submit to his rule. Regarded as the hereditary protector of the Ghibellines, he sent troops to Tuscany, by whom the Guelphs were defeated at Monte-

aperto. His court abounded with poets and artists, and he himself was noted for poetic skill. He was excommunicated by Pope Alexander IV., who vainly, however, proclaimed a crusade against him, and again by Urban IV., who offered his kingdom for sale to any European prince who had the strength to take it. Charles of Anjou, brother of Louis IX. of France, received the investiture of the Sicilian kingdom, was solemnly crowned by Pope Clement IV. at Rome, Jan. 6, 1266, and marched thence for the conquest of his realms. He was met by Manfred beneath the walls of Benevento. The latter was bravely supported by the Saracens, but the Apulians refused to advance against the enemy, the Sicilian army was thrown into disorder, and Manfred fell covered with wounds in the thickest of the battle. Dante alludes to his death and to his interment without religious rites (*Purgatorio*, canto iii.). He was twice married, first to Beatrice of Savoy, and next to Helena, a Greek princess, and left three sons and one daughter, who became the prisoners of the victor.

MANFREDONIA, a seaport of Italy, in the province and 22 m. N. E. of the city of Foggia; pop. about 7,500. It is situated at the foot of Mt. Gargano, and surrounded by walls, and the harbor is protected by a strong castle. It is well built, is the seat of an archbishop, and has a Gothic cathedral, containing one of the largest bells in Italy, which stands in the old town (originally *Sipontum*), about 1 m. S. W. of the new. Salt is obtained from lagoons S. of the town, and there is a considerable export trade in that article, as well as in corn and oranges. The harbor is only accessible to small vessels. Manfredonia was founded about the middle of the 13th century by King Manfred. It was nearly destroyed by the Turks in 1620.

MANGANESE, a metal having the symbol Mn and the combining weight 55, long known in the mineral pyrolusite, used to neutralize the green color of glass. The ores containing it were variously styled female magnets, *magnesia nigra* in contradistinction to *magnesia alba*, alabandine from the city of Alabanda, manganodesum by the glass makers, and subsequently by different chemists manganese, manganium, and finally manganese. In 1774 Scheele, and Bergman described the black oxide as a peculiar earth, and Gahn afterward succeeded in isolating the metal from it by mixing the pulverized mineral with charcoal and oil, forming the mass into pellets, which were introduced into a brasqued crucible and exposed for an hour to the highest heat of a forge. The metal obtained in this way is very brittle, and, like cast iron, contains silicon and carbon, and has a variable specific gravity. Brunner adopted a method analogous to the one employed in the preparation of aluminum; the chloride of manganese was fused with an equal weight of fluor spar and one fifth its weight of metallic sodium. The metal thus prepared is very hard and brittle, will take a fine polish, cannot be scratched by a file,

cuts glass easily, does not change in moist air, is not attracted by a magnet and is not itself magnetic, and has the specific gravity of 7.16. Deville reduced manganese oxide by mixing it with one tenth its weight of sugar charcoal and exposing it for three hours to a white heat in a lime crucible enclosed in a brasqued crucible. The product was a crystalline mass, the powder of which decomposed water rapidly; color like bismuth; specific gravity 8.015. Loughlin has subjected the above methods and numerous others to a careful repetition in his laboratory, and comes to the conclusion that the task of producing perfectly pure manganese is one of great difficulty. The discrepancy between the specific gravities, ranging from 6.85 to 8.015 as given by different experimenters, leads to the conclusion either that manganese has several allotropic modifications, or that the pure metal has not yet been made.—Some of the alloys of manganese are of great value. With copper it yields a product which possesses the color and properties of German silver, while costing much less. Elliot Savage of West Meriden, Conn., has invented a process for preparing this alloy by reducing pyrolusite and copper ore directly in a gas furnace. Dr. Prieger of Bonn and Valenciennes of Paris have prepared several alloys of manganese and iron and manganese and copper. An intimate mixture of black oxide of manganese, powdered charcoal, and iron filings or turnings is made in a black-lead crucible holding 30 to 50 lbs. A covering is made of charcoal, fluor spar, and common salt, and the contents of the crucible are exposed for several hours to a white heat. The alloy of manganese and copper is prepared in a similar way, and both are very hard and capable of a high polish. In England there are 36 patents involving the use of manganese in iron and steel, the earliest of which was taken out in 1799. Berthier made a large number of alloys of manganese, and described their properties. Much use is now made of manganese in the metallurgy of iron and steel, and the franklinite ore of New Jersey is largely employed in the United States in the manufacture of crystalline burglar-proof iron and spiegel iron.—Manganese does not occur native, but is found widely diffused in association with other elements. The following are the principal manganese minerals, the first being the chief ore of commerce: pyrolusite, braunite, manganite, rhodonite, hausmannite, alabandine, diallagite, wad, psilomelane, franklinite, crednerite, columbite, wolfram, triphiline, and manganese alum. Mines of manganese have been worked at Bennington, Vt., West Stockbridge and Sheffield, Mass., and later in North Carolina and Virginia. In 1871 \$20 a ton was paid in New York for 70 per cent. Virginia ore. The annual production of manganese ore in Europe may be approximately stated as follows:

Nearly nine tenths of the manganese of commerce is consumed in the manufacture of chlorine and bleaching powders; the other tenth is employed in the following industries: to color and decolorize glass; in the manufacture of iron and steel; in the painting and glazing of porcelain and pottery; in the production of oxygen; and in the preparation of the various salts required in medicine and the arts.—Manganese enters as a base into two classes of compounds, the manganous and manganic; and also as an acid into two classes of salts, the manganates and permanganates. There are five well characterized oxides. 1. Manganous oxide, or manganese monoxide, MnO , is a basic body furnishing a series of manganous salts, pink-colored, which rapidly absorb oxygen, and pass into a higher state of oxidation. The pure oxide is a greenish powder obtained by heating the carbonate in absence of air; the hydrate is precipitated as a white gelatinous mass, when an alkali is added to a solution of a manganous salt. Of the manganous salts the chief soluble ones are the sulphate, $MnSO_4 + 5H_2O$, and the chloride, $MnCl_2 + 4H_2O$. The sulphide, MnS , and the carbonate, $MnCO_3$, are insoluble. 2. Manganic oxide, or manganese sesquioxide, Mn_2O_3 , exists in nature as braunite, and may be prepared artificially by exposing manganous oxide to a red heat. It forms a series of insoluble salts, of which manganese alum is one of the most interesting. 3. Red or manganic-manganic oxide, Mn_3O_4 , is a neutral body, corresponding to the magnetic oxide of iron, and occurring in nature as hausmannite. 4. Black oxide or manganese dioxide, MnO_2 , is the chief ore of commerce, the *magnesia nigra* of the ancients, and termed pyrolusite by modern mineralogists. It can be artificially formed by adding a solution of bleaching powder to a manganous salt. This compound yields one third of its oxygen when heated to redness, and one half its oxygen when heated with sulphuric acid. According to Görgeu, MnO_2 is capable of forming manganite salts with alkaline bases. 5. Permanganic acid, $H_3Mn_2O_7$, is a dark green heavy liquid, obtained by the action of strong cold sulphuric acid upon potassium permanganate. Manganic trioxide, its corresponding hydrate, manganic acid, and the anhydride of permanganic acid, are not known in a free state. The salts of the permanganates, notably the potassium permanganate, are now largely employed as disinfectants, for bleaching, and in the laboratory for the purpose of volumetric analysis. Among numerous methods for the preparation of potassium permanganates, the following may be recommended: 500 lbs. of freshly prepared potash lye of $45^\circ B$. are mixed with 105 lbs of pure potassium chlorate, and concentrated by evaporation in an iron kettle; and then, under constant stirring, 182 lbs. of finely pulverized black oxide of manganese are added, and the heat continued until the whole is fluid; it is then stirred until cold; the granular mass is again heated to redness in small

Huelva, Spain. 1,000,000 cwts.	Saxony..... 13,579 cwts.
Prussia..... 531,422 "	Austria..... 9,292 "
Thuringia..... 82,108 "	Sweden..... 2,400 "

iron kettles until it is wholly fused, and is then, after cooling, broken up, boiled with water in a large pot, and allowed to settle; the clear liquor is decanted and evaporated to crystallization. In this way, from 180 lbs. of oxide of manganese, 98 to 100 lbs. of potassium permanganate, in beautiful long needles, can be obtained. For the bleaching of engravings and paper stock, for the purification of drinking water, as a disinfectant in hospitals, as a deodorizer of tainted meat in culinary operations, as a tooth wash under the name of Condyl's liquid, for the evolution of ozone oxygen, and for chemical analysis, there are few agents more valuable than potassium permanganates.—Various colors or dyes are prepared from salts of manganese. Nuremberg violet is made by fusing finely pulverized pyrolusite and phosphoric acid in proper proportions, digesting in ammonia, filtering, evaporating to dryness, and treating with water, when a violet powder remains. Barium manganate affords a fine green pigment, much safer than arsenic colors. Potassium permanganate dyes wood in imitation of mahogany and nut wood. The employment of manganese in glass manufacture was one of the earliest uses of this element. The oxide of manganese is put into the glass mixture to counteract the effect of oxides of iron; but in course of time it is itself oxidized by the light and air, and colors the glass red. As red glass intercepts the chemical rays of light, the skylights of photographers and the sashes of greenhouses have to be provided with glass to which no manganese has been added. The manufacture of oxygen on a commercial scale, according to the process of Tessié du Motay, is founded upon the property of the black oxide of manganese, when fused with caustic soda, to take up oxygen from a current of hot air, which it yields up again to superheated steam, thus offering a cheap and continuous process.—As the principal application of the oxides of manganese is in the manufacture of bleaching powders, their commercial value depends upon the amount of oxygen they can furnish, or, which comes to the same thing, the quantity of chlorine which they are capable of eliminating when treated with hydrochloric acid. The methods of assaying the oxides of manganese may be classed under four heads: 1. The determination of the amount of oxygen disengaged by sulphuric acid; 2, the oxidation of oxalic acid; 3, the evolution of chlorine from hydrochloric acid; 4, volumetric estimation. For the details of these methods the reader is referred to Fresenius's "Chemical Analysis." The chloride of manganese, obtained by crystallization from the residues in the manufacture of chlorine from the dioxide and hydrochloric acid, is regenerated so as to recover the dioxide to be employed again, by neutralizing its solution with excess of manganese and treating with hypochlorite of lime; by slightly elevating the temperature chlorine is disengaged, and the hydrate of the dioxide is

precipitated in great purity, thus accomplishing a great saving in the quantity of hydrochloric acid and manganese required in this important industry.—Several salts of manganese have been used in medicine, the most important of which are the dioxide, iodide, sulphate, and phosphate, and permanganate of potassium. The first of these is said, when slowly introduced into the system, as happens to those engaged in grinding the mineral, to act as a poison, finally inducing paraplegia; but this is by no means a common occurrence. It has been used as a tonic, and also as a local remedy in dyspepsia. The iodide, sulphate, and phosphate are used together with or instead of the corresponding salts of iron, and are supposed to have a similar action. Minute quantities of manganese have been found in the body, but it is extremely doubtful whether its presence is of physiological importance, or is in fact anything more than an accident. Although the therapeutic value of these compounds may be doubted on theoretical grounds, yet practically they have been occasionally found of service. Cases of anæmia that have proved rebellious to chalybeates will sometimes yield to the salts of manganese. In chronic nervous debility also these salts sometimes act favorably as a tonic to the nervous system in some unexplained way. The dose of the sulphate of manganese is from 5 to 10 grains. The sirup of the iodide is one of the best preparations of manganese for medicinal use; its dose is from 10 to 20 drops three times a day, and should be given in water soon after eating.

MANGEL WURZEL. See BEER.

MANGLES, James, a British traveller, born about 1785, died about 1861. He entered the navy in March, 1800, took part in the expedition to the Cape of Good Hope, and became a commander in 1815. In 1816 he visited the Levant, went up the Nile, and joined Belzoni in clearing away the sand from the entrance to the great temple of Ipsambul. They then crossed the desert to Syria and the Dead sea, whence in 1820 they returned to England. In 1823 they printed for private circulation a selection from the letters written by them while absent, republished in 1844 under the title of "Travels in Egypt and Nubia, Syria, and the Holy Land."

MANGOUSE, or Mongous. See ICHNEUMON.

MANGO, the native name of an East Indian fruit, of species of *mangifera*, of which 14 are known; some of them have been cultivated and become completely naturalized in the West Indies and other tropical countries. The genus belongs to the *anacardiaceæ* or cashew family, of which our native representatives are the sumachs. The most important species is *M. Indica*, of which there are numerous varieties; it is a large spreading tree, with simple, entire, leathery, lanceolate leaves, and large terminal panicles of flowers; the calyx is four- or five-parted, petals six; the stamens four or five, only one or two of which are fertile; ovary

one-celled, with a curved style; the fruit is large, 3 in. or more long, ovate, and very variable in shape and color; it is at first green, and then becomes partly or wholly orange-colored; beneath the skin there is in the better varieties a rich delicious pulp, in the centre of which is a large stone, to which the inner portion of the pulp is attached by coarse fibres,



Mango (*Mangifera indica*).

something after the manner of a clingstone peach. The largest varieties weigh two pounds, but the fruit is usually not larger than a goose egg. In its fresh state the fruit is much prized by the inhabitants of tropical countries, and it is sometimes offered in a very poor condition in our seaport cities. It is sent from the West Indies in the form of a sweetmeat, but in that state it is simply sweet and flavorless. The green fruit, pickled and highly spiced, is imported into England from the East Indies; an imitation of this pickle, called mangos, is made of green melons stuffed with aromatics. Some of the varieties are not edible on account of their strong flavor of turpentine, and being very stringy also, one writer compares them to "a mixture of tow and turpentine." The tree is sometimes cultivated under glass as a curiosity. The wood is used together with sandalwood by the Hindoos in burning their dead; the bark possesses astringent properties, and the tree when wounded exudes a gum resin which is also astringent. The natives of India are said to make use of the astringent leaves and leaf stalks of the mango to harden the gums, and they also employ them as remedial agents in other ways. The seeds are said to possess anthelmintic properties, and when boiled are eaten in times of scarcity.

MANGOSTEEN (Malay, *mangostana*; *Garcinia mangostana*), a tree growing with an upright stem to the height of 20 ft., and bearing a very beautiful and eatable berry, esteemed the most delicious of East Indian fruits. The genus *Garcinia*, of which there are over 30

species, belongs to the natural order *guttifera*, which contains trees that are natives of the hottest parts of the world, and characterized by thick, entire, opposite leaves and resinous juices. Several species of *Garcinia* furnish a portion of the gamboge of commerce. In the mangosteen the leaves are about 7 or 8 in. long, and about half as much in breadth at the middle, gradually tapering at both ends, of a shining green above, but of an olive color beneath. The flower resembles a single rose, composed of four roundish petals, of a dark red color, which are thick at the base, but thinner toward the margins. The fruit is about the size and shape of an orange, and is crowned by a broad peltate-lobed stigma; the rind is like that of the pomegranate, but softer, thicker, and fuller of juice; it is green at first, but changes to a dark brown with some yellowish spots; the inside is white or of a rose color, and is divided into several cells by thin partitions, in which the seeds are lodged, surrounded by a soft, juicy pulp, of a delicious flavor partaking of the strawberry and the grape; one writer describes its qualities as "utterly inexpressible." It can be eaten in great quantities without any inconvenience, and it is the only fruit which sick people in India are allowed to eat without scruple. It is said that Solander, when in the last stage of a putrid fever at Batavia, found great benefit from sucking this delicious and refreshing fruit. The pulp has a most happy mixture of the tart and the sweet, and is no less salutary than pleasant. The dried bark of the *Garcinia* is



Mangosteen (*Garcinia mangostana*).

astrigent, and has been used in dysentery and in infusion as a gargle for sore mouth; the Chinese employ it for dyeing black. The several species are beautiful stove plants.

MANGROVE, a common name for three or four tropical plants, but mainly applied to species of *rhizophora* (Gr. *ρίζα*, a root, and *φέρειν*, to bear), a genus so called on account

of the aerial roots borne by the plants; the genus gives its name to the small family of *rhizophoraceæ*, which is nearly related to the myrtle family. There are but few species, the



Mangrove.

best known of which is *R. Mangle*, a plant common in tropical countries; its northern limits upon this continent are southern Florida on the Atlantic and Lower California on the Pacific coast. It is a tree sometimes 40 ft. high, but usually much smaller, with opposite, entire, leathery leaves, and axillary, few-flowered clusters of showy flowers; the persistent calyx has an obovate tube and a four-lobed limb; the yellow petals are four, thick, notched at the apex, and woolly on the margins; stamens eight; ovary two-celled with



Fruit of Mangrove.

two ovules in each cell; fruit one-celled, indehiscent, at length perforated by the radicle of the embryo, which germinates while the fruit is still upon the tree. The mangrove is found in muddy localities directly upon the seashore, where it forms impenetrable thickets; its manner of growth is like that of the banian tree in miniature, as the stem and branches produce long slender roots, which finally reach the earth and become fixed. The mangrove not only prevents the encroachments of the sea upon the land, but acts an aggressive part in wresting land from the sea; the seeds, which might be washed away if they fell as soon as

ripe, germinate while yet attached to the stem, and when one falls it is already provided with a long radicle; in fact they are not properly any longer seeds, but young plants, which when they drop into the mud are ready to grow at once; after the young tree has formed a stem and head of branches, it is then by means of its aerial roots enabled to spread and occupy more territory, and thus advance seaward, while its fruit will drop beyond the line of the parent tree and new plants be produced further from dry land. The tangled mass of stems and roots in a mangrove thicket retains the débris from the land that may be brought down by floods, and thus upon the land side of the grove solid ground is gradually formed. From the great quantity of decaying vegetable matter collected in a mangrove thicket, such localities are highly malarious. The account of oysters growing upon trees is not, as has been supposed, a traveller's fable, for the submerged portions of the branch-like roots of the mangrove are often studded with these and other mollusks, and when the tide recedes oysters may be literally gathered from trees. Other species are found on the Malabar coast, and one is found on the Feejee and neighboring islands. The wood of the mangroves is tough, hard, and durable in the water; hence it is employed for boat building, a use for which the natural curves of its branches and its numerous knees especially adapt it. The bark contains a large amount of tannin, and is used all over the West Indies in the preparation of leather, as well as by dyers, giving with different mordants slate-colored and various brown tints. Occasional shipments of the bark have been made to England, but as there are many products which are much richer in tannin in proportion to their bulk, it is not likely to become a regular article of commerce. The fruit of the common mangrove is ovate and crowned with the persistent calyx, and said to be sweet and edible; its fermented juice makes a kind of light wine.

MANHATTAN ISLAND. See NEW YORK.

MANHEIM. See MANNHEIM.

MANICHÆANS, a religious sect of the East, founded about the middle of the 3d century. Its origin is involved in obscurity, oriental and occidental writers differing much in their accounts of it. According to the latter, Manes or Mani, the founder of the sect, was not the originator of his doctrines. The fullest account of his life and of the source of his system is given by Epiphanius, and is in all essentials corroborated by Cyril, Socrates, Theodoret, Suidas, Cedrenus, and the *Acta Disputationis S. Archelai* from which their statements were derived. This work, of uncertain authorship, and extant only in a corrupted form, is rejected by some scholars as wholly unhistorical. It contains an account of a disputation between Manes and Archelaus, bishop of Cascar. It states substantially that a certain Scythianus, an Arabian by birth, but a native of Scythia,

a man of much learning, wealth, and travel, conceived the idea of a dualism, the doctrine of good and bad principles. His disciple Terebinthus composed for him four books, entitled *Μυστήρια*, *Κεφάλαια*, *Εὐαγγέλιον*, and *Θησαυροί*. Scythianus was intending to go to Judea, in the time of the apostles, and teach his doctrines there (as he did, according to Epiphanius), when he suddenly died. Terebinthus fled to Persia, took the name of Budda, and taught the doctrine of Scythianus. Seeing that he was not gaining disciples, he attempted to deceive by magic arts, and while in the act fell from a roof and died. The books of Scythianus became the property of an old woman in whose house he had been lodging, and whose slave, Cubricus, called also Manes, inherited them at her death. Manes studied the doctrine and undertook to teach it, but with little success. Attempting to cure a sick child of the king of Persia with some of the remedies given in his books, and failing, he was thrown into prison. Shortly before this occurrence Manes had sent his disciples Thomas, Hermas, and Addas or Adda to Jerusalem to study the Christian religion. Upon their return they gave him the Christian books which they had bought, and he studied them in his prison, and embodied many Christian doctrines, changed and falsified, in his own system. Shortly after he succeeded in making his escape. He challenged Marcellus, a pious Christian of Cascar (Kaskar) in Babylonia, to a religious disputation, and was defeated. He then went to a place designated as Diodori Vicus, where he disputed with the bishop Archelaus and the presbyter Trypton, and was again discomfited. He was finally taken prisoner and sent back to Persia, where he was flayed alive, and his skin, stuffed with straw, was publicly exhibited as a warning. Several reasons, as pointed out by Baur (*Das Manichäische Religionssystem*, 1831), tend to show that the strange particulars of Epiphanius's narrative are far from being all historical. The *Fihrist el-ulum* ("List of Sciences"), the oldest known literary history of the Arabs, written about 987 by Abulfaraj Mohammed ben Ishak en-Nedim, a book which still made use of the works of Manes and his disciples, no longer extant, has statements in regard to Manes which are at variance with those of Epiphanius. According to this, Manes was born in Otesiphon, the son of Futlak Babek or Fatek, of Hamadan, and of a woman probably of Babylonian origin. When 12 years old Manes became the subject of a divine inspiration, and at the age of 24 he was asked to act as a prophet. De Sacy, in his *Mémoires sur diverses antiquités de la Perse*, adduces several oriental books which state that Manes, after hiding himself in a cave for a year, pretended to have come from heaven, where he had received a painted slate, thereafter known as the *Erteng-i-Mânî*. It is further stated that Manes alleged that he had received his doctrine from the king of paradise through the mediation of an angel. He

himself was the Paraclete of whom Christ had spoken. His tenets were derived partly from Christianity and partly from the Magi. His writings were six in number, one in Persian and five in Syriac, besides a multitude of epistles. The graphic system employed by himself and his disciples is said to have been peculiar, resembling both Persian and Syrian characters. Most of the oriental writers agree that Manes came to a violent death, and that he was brought before a tribunal of priests, charged with heresy, and condemned. Spiegel, in his *Eränische Alterthumskunde* (vol. ii., 1873), is inclined to consider historical the statements that Manes entered the career of a prophet when he was 24 years old, and that he addressed himself both to the Zoroastrians and Christians of Mesopotamia.—The Manichæan system is a mixture of Parseeism, Christianity, Babylonian mythology, and Buddhism. It contains a dualism different from that of the Magi, and shows the same easy transition from the concrete to the abstract characteristic of the Iranian religion. It assumes that there are two kingdoms existing from all eternity, those of light and of darkness, coexisting with and bordering on each other; the former under the dominion of God, the latter under the dominion of the demon or Hyle (matter). (See Gnosticism.) An inroad was made by the kingdom of darkness, the barriers were broken through, the primitive man, God's first-born son, was for a time imprisoned, and the materials of light and darkness were intermixed. God now caused the world to be made out of this mixed material. It was made by the "living spirit," in order that the unmixed and imprisoned material of light, which is called by the Latin writers *Jesus patibilis*, might be separated by degrees, and the old boundaries restored. This recapturing of the material of light was effected by Christ and the Holy Spirit, who inhabit respectively the sun and moon and the air, while the demon and evil spirits are fettered to the stars. Adam, the progenitor of the human race, was created after the image of the primitive man. Every man has two souls, one of light, the other of darkness; and it is his mission to subject the latter to the former, uniting with his soul of light some of the material of light imprisoned in certain plants, and so fitting it for return to the kingdom of light. The demon long led men astray by the false religions of Judaism and heathenism; but at length Christ descended from the sun, assumed a bodily appearance, and taught true worship. He was not fully understood even by his apostles; still less by their successors, whom Manes contemptuously calls Galileans. Hence Christ promised the Paraclete, who appeared in Manes. The Manichæans therefore rejected wholly the Old Testament, and partially the New. They appealed to apocryphal writings, and especially to the writings of Manes, which alone they acknowledged as authoritative. The spirit of their

morality was self-conquest by asceticism, of which they held to three degrees: 1, what the Latin writers call *signaculum oris*, abstinence from all impure words, and even thoughts, and from any kind of food which might increase the power of the body over the spirit, and especially flesh, wine, and strong drinks; 2, the *signaculum manuum*, abstinence from such work as makes this world an attractive home; 3, the *signaculum sinus*, abstinence from sexual intercourse. Legal external marriage was not absolutely forbidden, but celibacy was strongly recommended, while abstinence from procreation was a moral duty. This rigorous asceticism imposed on the baptized members such privations that most Manichæans remained catechumens, postponing baptism as long as possible. The worship of the Manichæans was very simple. Sunday was celebrated by fasting; they kept the day of Manes's death as an annual festival; they administered baptism with oil, and admitted only baptized members to the Lord's supper, which was celebrated in secret. Manes himself sent out 12 apostles, and these were afterward represented by 12 *magistri*, with a 13th invisible one, without doubt Manes himself, at their head. After them followed 70 or 72 bishops, who in turn had under them presbyters, deacons, and the other *electi*, or baptized members of the church.—The cruel execution of Manes, the date of which is commonly fixed at A. D. 276, in the reign of Bahram I., was undoubtedly followed by a persecution of his disciples. The Manichæans consequently fled from Iranian territory into lands occupied by Tartaric races, where Buddhism was the general religion, and toleration was shown to other sects. They returned to the west only after the fall of the Sassanian dynasty, and settled especially in Babylon and its environs, which became the seat of the Manichæan primate, and seems to have been looked upon as a sort of holy city. Many emigrated to Khorasan in the reign of the caliph Mukhtadir, and still more to Samarcand. Moslem fanaticism did not disturb them here, as the chief of the Turkish tribe of Tagazagay, who took an interest in them, threatened vengeance against the Mohammedans in his territory if any harm should be done to the Manichæans. At the time of the author of the *Fihrist*, in the 10th century, there were but few Manichæans in the west, and in Bagdad their number diminished, within his own recollection, from 300 to 5. Manes had appointed Sis or Sisinnius to be his successor as the head of the church, and the succession was continued for several centuries. But in the time of the caliph Walid I. (705), while Mihr was the head of the Manichæans, a certain Zadhurmuz separated from the community and built in Madain a temple, of which he declared himself to be the chief. He appointed Miklas to be his successor, and hence those who adhered to him were called Miklasiya, and those who recognized the authority of Mihr were called

Mihriya. It seems that the two sects were subsequently reunited. During the caliphate of Al-Mamoun (813-833) one Yazdanbakht caused another schism, of which very little is known. The doctrine of Manes succeeded in gaining many converts, as it appealed largely to the imaginative and philosophic character of the oriental mind.—Manichæism spread beyond Iran and Mesopotamia over Asia Minor and Africa, and it found its way into Europe. Its history may be divided into three periods. The first period extends to the end of the 6th century, until which time the Manichæan doctrines continued in a measure in their original oriental form. In Africa its success was sufficiently great to be looked upon as the rival of Christianity. It numbered among its converts many eminent and learned men, as Alexander Lycopolitanus, Faustus of Milevi, and even St. Augustine for at least nine years. St. Augustine says that the name of Manes or Mani was changed to Manichæus, in order to avoid ribald remarks called forth by the resemblance of the former to the Greek *μῆνις*. The persecutions of Diocletian, Constantine, Gratian, Theodosius, Valentinian, and Honorius finally succeeded in weakening their power, and the Vandal kings drove them out of Africa into Sicily and Italy, where Pope Leo I. and Valentinian III, soon took measures either to convert or destroy them. But a century and a half later Gregory I. still complained of the large number of Manichæans in Christian lands. Persecutions had taught them, however, the wisdom of appearing to adopt some of the Christian rites and doctrines, which had the effect of gradually perverting the oriental faith into a Christian heresy, and thus Manichæism entered upon a new phase of its existence. The second period reaches from the 7th to the 11th century. Cappadocia and Armenia had been the cradle of strong Manichæan communities, which, finally exiled into Bulgaria, by degrees renounced even the name and headship of Manes, and rejected various doctrines seemingly unintelligible and unprofitable. Constantinople was not as severe on them as the Roman pontiffs and emperors, though the East finally subjected them to the same persecutions which their brethren had suffered in the West. (See PAULICIANS.) The Manichæans of Italy soon came under the influence of the Bulgarian reform, and a new variety of the original doctrine sprung up in the West. This third development embraces the 11th, 12th, and 13th centuries. Germany, France, and Italy proceeded against the heretics with unwavering severity, and even the populace joined in a general persecution of them, surrendering them to the penalty of death. (For the history of these new sects, see ALBIGENSES, and CATHARISTS.) In modern times the various forms of Manichæism have gradually disappeared, and to all appearance, perhaps with the exception of a few in Bulgaria and Persia, disciples of Manes are nowhere to

be found. In theological polemics the term Manichean is still applied to doctrines representing evil as a substance, identifying it with matter, or regarding the body of man as the source or seat of sin.—The writings of Manes and his immediate disciples are not extant. Fragments are found quoted in the writings of their opponents, as in the *Acta Disputationis Sancti Archelai, Episcopi Mesopotamensis, cum Manete*; St. Augustine, *Contra Faustum Manichæum*, and *Contra Fortunatum Manichæum*; and St. Epiphanius. Besides the accounts of Manichæism found in works on ecclesiastical history, and the special works mentioned above, see Schmidt, *Histoire et doctrine de la secte des Cathares ou Albigeois* (2d ed., Paris, 1849), and Flügel, *Mani, seine Lehre und seine Schriften, ein Beitrag zur Geschichte des Manichæismus, aus dem Fihrist, im Text nebst Uebersetzung* (Leipsic, 1862).

MANIKIN. See ANATOMICAL PREPARATIONS.

MANILA, a city, capital of the island of Luzon, and of the whole Philippine archipelago, near the mouth of the Rio Pasig, which empties into the bay of Manila; lat. 14° 36' N., lon. 121° E.; pop. (including the suburbs) from 140,000 to 150,000, of whom the Spaniards and creoles are about one tenth, the remainder being native Tagalas, mestizos, and Chinese. Most of the Chinese are engaged in commerce, and but few in agriculture. The city is divided by the river into two sec-

tions, Manila proper and Binondo. The former, which is the military town, is surrounded by lofty walls, and communicates with Binondo by a fine stone bridge 511 ft. long, with 10 arches, first built in 1630, but rebuilt in 1814. The situation of the town is beautiful. On one side is the bay, in a framework of forest-clad mountains declining gradually toward the shore; and on another a picturesque plain, where are the military parade ground and the fashionable promenades, crowded in the evening with showy equipages and gay equestrians and pedestrians. The aspect of Manila proper is somewhat dull and monotonous. The streets are perfectly straight, macadamized, and provided with ample granite sidewalks. The houses, which have in general a sort of palatial appearance, are of two stories, and built in a manner to resist the hurricanes and earthquakes so frequent here. The upper story,

commonly occupied by the family, is encircled by a spacious gallery, from which the sun is excluded by large sliding panels with mother-of-pearl panes, sufficiently transparent to admit light to the apartments. In this town are the cathedral and some other churches, with all the monasteries and convents, both of which are numerous; the governor's palace; the citadel, overlooking both towns; the courts of justice, custom house, barracks, arsenal, hospital, and other public buildings. Binondo, on the N. bank of the river, is much larger and more animated; but the streets are less regular and many still unpaved. Numerous canals, crowded with pirogues, gondolas, and other boats, intersect this suburb, in which reside the wealthy merchants, Spanish, English, Indian, Chinese, and mestizos. The newest and most elegant houses on the banks of the Pasig, though of unassuming exterior, are highly adorned within. Each house has a landing



Manila.

place from the river, and little bamboo huts to which the inhabitants repair several times a day for bathing. In other parts of the town there are sombre and massive structures interspersed with airy bamboo cottages perched on posts, in the midst of avenues of tropical trees, giving to the place an appearance at once Spanish and oriental. The only square worthy of remark in either town is the Plaza Mayor in Manila proper, some 300 ft. square, and embellished with a fine statue of Charles IV. of Spain, presented by Ferdinand VII. in 1824. The climate is intensely hot, but tolerably salubrious; hurricanes occur frequently, and heavy rains fall at short intervals, especially during the wet monsoons, which prevail five months out of the twelve. The temperature is equable, seldom rising above 99° F. or descending below 70°. Vessels of deep draught have to anchor at Cavité, about 7 m. distant;

but the anchorage in the port of Manila is excellent for small vessels. Manila is by law the sole emporium of foreign trade with the Spanish East Indies. The chief articles of export are sugar, tobacco (exclusively to Great Britain and Spain, the latter receiving annually a state tribute out of the tobacco crop to the amount of \$800,000), cigars, hemp, coffee, indigo, copper, and gums and other tropical products. The imports include cotton, linen, woollen, and silk fabrics, manufactured iron, wines, beer, &c. The total value of the exports for the year ending Sept. 30, 1872, was \$18,679,770 19; of the imports, \$2,557,227 42; the amount of duties paid on the latter was \$284,406 31. The more important commercial relations are with Spain, Great Britain, the United States, France, Germany, China, Chili, and the Hawaiian islands. The tobacco manufacture, a government monopoly, employs 20,000 workers of both sexes. (For other manufactures, see LUZON, and PHILIPPINE ISLANDS.) Educational establishments are numerous in Manila: there are the university of St. Thomas, with 500 students; that of St. John, with 250; a royal marine school (established in 1820), a commercial (1840), and a number of primary schools public and private.—Manila was founded by the Spaniards in 1571, on the site of a Malay town defended by stockades. Miguel Lopez de Legazpi, conqueror of the Philippines and founder of the city, was indefatigable in promoting its growth. He founded the cathedral, the metropolitan church of all Catholic Oceanica, and established a municipal organization, which was confirmed by Philip II. of Spain, and continues to be the form of municipal government in Manila. Chinese laborers and traders settled here in large numbers, and in time became very turbulent. In 1603 an insurrection took place, and 23,000 Chinese were massacred; notwithstanding which, the Chinese population in 1639 numbered in Manila about 30,000. The severity of imposts and religious persecution again led to insurrection, which terminated with the slaughter of about 25,000 Chinese, and the banishment of the remainder; but they soon again resorted to the city in large numbers, and assisted Admiral Cornish and Sir William Draper in the capture of it in 1762. The English expedition, composed of 2,300 Europeans and sepoys, which sailed from Madras, took the city by storm, after a siege of ten days. The governor and archbishop agreed to pay \$5,000,000 to save the rich cargoes then lying in the port; but the king of Spain refused to ratify the offer. Sir William Draper has been rendered conspicuous by his controversy with Junius concerning this ransom. Manila was restored to Spain by the peace of Paris, Feb. 10, 1763. The Japanese had much trade with the city, and were settled in it in large numbers during a portion of the 17th century, before their laws excluded them from all communication with the rest of the world. They imported

the raw material extensively used in their manufactures directly from the Philippines. Earthquakes have been frequent and disastrous; in that of 1645, 3,000 lives were lost; and those of 1762, 1824, and 1852 were also destructive of life and property; while in that of June, 1863, about 1,000 persons perished. In March, 1833, about 10,000 huts were burned, some lives were lost, and about 30,000 people left homeless.

MANILA, or **Manila Hemp**, the fibre of *musa textilis*, a native of the Philippine islands, and of the same genus with the banana and plantain. The tree, known in the islands by the native name of *abaca*, has a similar habit of growth to the banana and other musas; the



Manila Hemp Tree (*Musa textilis*).

stem proper is small, and is surrounded by the broad sheathing petioles of the leaves, together making a kind of false stem, which in the abaca is 15 or 20 ft. high; the leaves are dark green, and resemble those of the banana; the fruit is small and triangular, resembling an abortive banana, and full of black seeds; the plant is readily multiplied by seeds and by suckers, and propagates itself so freely as to take complete possession of the land. When the stems are about to flower they are cut down, and split longitudinally in four pieces; the petioles, which are the portion furnishing the fibre, are then pulled off, the outer ones, which furnish the coarsest and strongest fibre, being kept separate from the inner; those which grow

near the centre are rejected, as their fibres are not strong enough to be useful. To separate the fibre, the petioles are thoroughly beaten with wooden clubs, by which much of the adhering tissue is loosened; and the separation is further effected by the use of a coarse hackle, after which the fibres are frequently washed, and when freed of all extraneous matter they are hung upon poles or ropes to dry. The fibres are coarser or finer as they are from the outer or inner petioles, and they are carefully assorted, the coarsest being for cordage and the finer for weaving. As a material for ropes and other cordage its great tenacity and durability make it highly valuable, and large quantities are used for this purpose. From the finer fibres the inhabitants of the islands weave tissues of great delicacy; the fibres are not spun, but used in their natural state; those of a proper size being selected, the single fibres, which are about 15 ft. long, are tied together at their ends, and wound into a ball, soaked in hot water, and dried, when they are ready for weaving. Tissues woven from the abaca fibre are almost transparent, somewhat rigid, light, and cool to the touch; muslins, veils, napkins, &c., are made from it, and it is even woven into shirts and other articles of apparel; the material readily takes dyes of all colors. Large quantities of paper are made in whole or in part from manila, usually in the form of worn-out rope; it possesses great toughness in proportion to its weight.

MANILIUS, Marcus, a Latin poet, of unknown date and history. Bentley supposed that he was an Asiatic, and Huet that he was a Carthaginian, and there are indications in his only known poem, the *Astronomica*, that it was written under Augustus. The first manuscript was discovered by Poggio in 1416, and was printed at Nuremberg in 1472 or 1473. Other MSS. were afterward found, from which later editions were prepared. There is an English metrical translation by Creech (London, 1697).

MANIN, Daniele, an Italian statesman, born in Venice, May 13, 1804, died in Paris, Sept. 22, 1857. He studied law at the university of Padua, and commenced practice about 1830. He early became a champion of the national party, though aiming to combat Austria with legal weapons. After the accession of Pius IX. Manin and Tommaseo became the leaders of the reform movement in Venice (1847). Manin asked for a separate government of Venice and Lombardy, a revision of the codes, an annual budget, and freedom of religion and of the press. Upon Radetzky's bloody suppression of a riot in Milan (Jan. 9, 1848), his and his colleague's protests (Jan. 18) resulted only in the imprisonment of the two patriots. The revolution which soon followed forced the Austrian commander, Count Zichy, to surrender, March 22; the republic of Venice or St. Mark was proclaimed, March 23, and Manin and Tommaseo were placed at the head of affairs. The Venetians prepared to form an

independent republic in confederation with the other Italian states; but the Venetian assembly, convened June 3, agreed to the fusion with Sardinia and Lombardy so as to form a united kingdom of northern Italy under Charles Albert. Manin resigned; but after the king's defeat at Custoza (July 25), the Venetians prepared for a separate defence. The republican banner of St. Mark was again hoisted, Aug. 11, and a triumvirate was appointed to carry on a dictatorial government on the 13th, Manin being its head. After the defeat of Charles Albert's army at Novara, March 23, 1849, the Austrians concentrated their efforts upon the subjugation of Venice, while the French undertook the reduction of Rome. Fort Malaghiera, one of the forts outside of Venice, fell into the hands of the Austrians, May 26, and Rome was occupied by the French at the beginning of July. Venice, however, continued its resistance under the military lead of Gen. Pepe, and Manin only capitulated (Aug. 23) upon terms of amnesty to all except 40 conspicuous leaders, including himself, who were compelled to withdraw before the entrance of Radetzky. He spent the rest of his life in exile in Paris, supporting himself by giving lessons in Italian, and occasionally writing for the newspapers of Paris, London, and Turin. After the liberation of Venice his remains were brought from Paris at national expense, and buried with great solemnity (March 22, 1868). An edition of some of his writings was published under the title *Documents et pièces authentiques laissées par Daniel Manin* (Paris, 1860). See also *Daniel Manin*, by H. Martin (Paris, 1859), and Errera, *La vita ed i tempi di Daniele Manin* (Venice, 1872).

MANIOC, or Mandioca. See CASSAVA.

MANIS, an edentate animal of Asia and Africa. See PANGOLIN.

MANISSA, or **Manisa** (anc. *Magnesia ad Sipylum*), a city of Asia Minor, in the vilayet of Aidin, on the S. bank of the Hermus, and on the N. slope of Mt. Sipylus, about 20 m. N. E. of the city of Smyrna; pop. estimated from 30,000 to 60,000, chiefly Turks, with nearly 4,000 Greeks and a number of Armenians and Jews. There are numerous mosques, four Roman Catholic and several Greek and Armenian churches, and four synagogues. Among the public buildings are those for the Turkish lieutenant governor and for the Greek bishop, a splendid khan, a district lunatic asylum, the Ottoman bank, the railway station, and the new bazaar. The finest palace is occupied by the Karaosmanglu family, the former princes of Caramania, once omnipotent here, and still large landed proprietors. The principal export is cotton, which has been produced in considerable quantities since the civil war in the United States; and the Smyrna railway, opened in 1865, of which Manissa is the last station before reaching Kassaba, has rendered the cotton trade still more active in the two localities. (See *MAGNESIA*.)

MANISTEE, a N. W. county of the lower peninsula of Michigan, bounded W. by Lake Michigan, and watered by the Manistee river; area, about 550 sq. m.; pop. in 1870, 6,074. The surface is level, the soil fertile, and there are extensive forests of pine. The chief productions in 1870 were 5,517 bushels of wheat, 10,509 of Indian corn, 4,743 of oats, 29,360 of potatoes, 12,730 lbs. of butter, and 565 tons of hay. There were 1 manufactory of engines and boilers, 2 of sash, doors, and blinds, 1 of cigars, and 20 saw mills. Capital, Manistee.

MANISTEE, a city and the county seat of Manistee co., Michigan, on Lake Michigan, at the mouth of Manistee river, 135 m. N. W. of Lansing; pop. in 1870, 3,343; in 1874, 4,894. It is one of the chief lumber manufacturing points on the lake. The mills, about 20 in number, are situated on Manistee lake, an expansion of the river above the city. There are also an extensive tannery and seven shingle mills. Manistee has some fine residences, a good union school, and several churches. It was incorporated in 1869.

MANITOBA, a province of the Dominion of Canada, situated between lat. 49° and 50° 30' N., and lon. 96° and 99° W. It is bounded S. by Minnesota and Dakota, and on all other sides by the Northwest territories, and is 135 m. long E. and W. by 104 m. in breadth, forming nearly a parallelogram; area, 14,340 sq. m. It is divided into four counties, Lisgar, Marquette, Provencher, and Selkirk, which are subdivided into parishes. The capital and chief town is Winnipeg, on the N. bank of the Assiniboin or Assiniboine river, at its confluence with the Red, which has about 3,000 inhabitants, and contains within its limits Fort Garry, the American headquarters of the Hudson Bay company. The population of the territory now embraced within the province in 1823 was about 600; in 1843, 5,143; in 1849, 5,291; in 1856, 6,523; in 1870 (census taken Dec. 24), 11,963, of whom 5,757 were French half-breeds, 4,083 English half-breeds, 1,565 whites, and 553 Indians; in 1874, about 20,000. The half-breeds include all having any intermixture of Indian blood, and are the descendants of Indian mothers and French Canadian, English, or Scotch fathers, the Scotch element predominating over the English. The distinction of French and English in the census is based rather upon language than lineage. Since 1870 a considerable immigration, particularly from Ontario, has set in. The principal settlements are on both banks of Red river, from about 20 m. N. to 15 m. S. of Winnipeg, and along the Assiniboin for about 20 m. W. of that town. N. of the half-breed settlements on Red river is a village of settled and Christian Indians of the Swampy Cree tribe. The westernmost settlement on the Assiniboin is at Prairie Portage (Portage-la-Prairie), 67 m. above Winnipeg. Besides the Indians enumerated there are uncivilized Saulteaux and Maskegons, or Swampies, in the province, and some Sioux who have been driven from Minnesota. The

half-breeds are a handsome race, large, strong, and well made; they are generally swarthy, but many exhibit no sign of Indian extraction. Intrepid and indefatigable travellers, they manifest the Indian instinct in the ability to find their way through forests and across prairies. Many are employed by the Hudson Bay company as boatmen, guides, and sledge drivers; others are farmers; while a large proportion, especially of the French, pay comparatively little attention to agriculture, but pursue the buffalo in summer and winter on the plains W. and S. W. of the province. In general they are intelligent and hospitable, but prodigal of their earnings, fond of pleasure, inclined to drunkenness and indolence, and restive of restraint. Those engaged in farming, with a settled mode of life, have acquired more stable and provident traits of character than the hunters.—The general surface is a level prairie, 80 ft. above Lake Winnipeg and 700 ft. above the sea. It is broken by the Big ridge and Pembina mountain, ancient beaches of that lake which is supposed at one time to have extended over this region. The Big ridge, rising in places 60 or 70 ft. above the general level, commences near Lake Manitoba, N. of the Assiniboin river, and runs nearly parallel with that stream to the Red river, crossing which below Winnipeg, it continues in a S. E. direction to German creek, and thence a little W. of S. to the Roseau river, which it crosses near the United States boundary and 46 m. above its mouth. The Pembina mountain enters the province near the 98th meridian, and runs N. to the Assiniboin, just below Prairie portage. It marks the ascent from the general level to the hilly and undulating prairie on the south and west, which is about 100 ft. higher. West of Pembina mountain, and a little S. of the Assiniboin river, are the Blue hills, 300 to 400 ft. above the plain. Stony mountain, W. of Red river, and about 15 m. N. of Winnipeg, rises 60 ft. above the surrounding prairie. The valley of Red river through most of its course is liable to inundation in spring, and on several occasions has suffered severely. N. E. and E. of the Big ridge, along the border of the province, the country is marshy and swampy, forming part of the marshy region that extends from Lake Winnipeg S. E. to Rainy lake. Marshes also occur at other points both E. and W. of Red river.—The only important lakes are Winnipeg and Manitoba (from which the province derives its name), a small portion of the S. part of the former occupying the N. E. and of the latter the N. W. corner. The principal stream is the Red river of the North, which, rising in Minnesota, flows N. for 140 m. of its course through the province, and empties into Lake Winnipeg. It is navigable by steamers into Minnesota. Red river divides Manitoba into two unequal parts, about a third lying on the E. and two thirds on the W. bank. The chief tributaries from the east, commencing at the

United States boundary and going N., are the Roseau or Reedgrass river, Rat river, Oak creek, and la rivière Seine or German creek, which joins the Red just below Winnipeg. On the west the Pembina river drains the S. W. corner of the province, and flowing S. E. joins Red river in Dakota, a little S. of the boundary. Proceeding N., the other western tributaries are the Scratching river, la rivière Sale or Stinking river, the Assiniboin, and Netley creek, which joins the main stream near its mouth. The Assiniboin, the largest tributary, rises in about lat. 52°, W. of Lake Winnipegosis, flows first S. E., then bends E., and continues in this direction for about 150 m. of its course through Manitoba, emptying into Red river about 50 m. above Lake Winnipeg. The only other stream worth mentioning is White Mud river, which flows into Lake Manitoba.

—The geological formations occurring in the province are the Silurian in the east, the Devonian in the centre, and the cretaceous in the southwest, W. of Pembina mountain. These series run parallel with each other in a N. N. W. and S. S. E. direction. The Laurentian series occurs only in the N. E. corner. The soil of the greater portion, and particularly of the prairies extending for 30 m. on each side of Red river, consists of a deep alluvial deposit of rich black mould, resting partly on limestone and partly on a bed of hard clay. The limestone crops out on the Red river below Winnipeg, where it is suitable for building material. Stony mountain consists of limestone. The elevated prairie W. of Pembina mountain is covered with a light sandy clay loam, and near Scratching river the soil is light and sandy. Big ridge is composed of gravel, and Pembina mountain consists of clay, gravel, and sand, thickly strewn with granite boulders. Salt springs are found in the valley of la rivière Sale, and at one or two points on Red river further S.; and there are saline deposits near Stony mountain and in the vicinity of Lake Manitoba.

—The climate is healthy, but exhibits great extremes of temperature, the thermometer falling in winter to 40° below zero and even lower, and in summer rising as high as 100°. Owing to the dryness of the atmosphere, the cold is not severely felt, and horses winter on the prairies without shelter, fattening on the grasses which they dig from beneath the snow, which is seldom very deep. The rainfall in summer is ample for agricultural purposes, and vegetation comes rapidly to maturity. Winter sets in with the commencement of November, and continues to the middle of April. Frosts are liable to occur until the end of May, and cold nights begin toward the end of August. The mean temperature at Winnipeg of the year ending May 31, 1873, was 33°; of summer, 65·7°; of autumn, 37·5°; of winter, -3·3°; of spring, 32·1°; warmest month (July), 67·6°; coldest month (December), -9°. The total precipitation of rain and melted snow was 22·33 inches.—The soil is very fertile. Wheat

is the staple crop, and yields abundantly, 40 bushels to the acre being commonly raised. Barley, oats, rye, potatoes, turnips, beets, carrots, parsnips, cabbage, lettuce, &c., also do well. Indian corn is not much cultivated, though some varieties come to maturity in the driest soils. Flax and hemp have been successfully grown. The prairie grasses furnish good hay, and afford nutritious pasturage. Considerable numbers of horses, cattle, sheep, and swine are raised. Grasshoppers or locusts are the chief pest of the farmer, and have on several occasions destroyed all vegetation. The principal wild fruits are strawberries, currants, raspberries, plums, cherries, blueberries, whortleberries, and marsh and high-bush cranberries. Wood is scarce, and is found chiefly in narrow strips along the Red and Assiniboin rivers, the timber belt extending from $\frac{1}{2}$ m. to 2 m. back from the stream on either bank. There are also portions of woodland along the other streams. The principal trees are the elm, oak, maple, and poplar; tamarack, spruce, cedar, and birch also occur. The ridges afford small aspens and pines, and clumps of willows and aspens are found in the marshes, as well as on portions of the prairies. The ash-leaved maple (*negundo fraxinifolium*) yields sugar. Among the wild animals are elk, rabbits, badgers, and squirrels. There are ducks, geese, cranes, swans, snipe, prairie hens, and other birds. The rivers and lakes swarm with whitefish, sturgeon, trout, cat fish, pike, perch, and gold-eyes.—There are no returns of the trade with the other provinces of the Dominion. The value of goods entered for consumption from foreign countries for the year ending June 30, 1873, was \$1,029,130, of which \$509,838 were from Great Britain and \$441,559 from the United States. The exports to foreign countries amounted to \$246,983, all but \$4,915 consisting of furs. The greater part of the exports were to Great Britain, the rest to the United States. There are no railroads in Manitoba, but the projected Canadian Pacific line is to pass through it, and a railroad has been commenced from Winnipeg to the United States boundary, to connect with the Minnesota system. There is telegraphic communication with the United States.—The government is based upon the British North American act (1867) of the imperial parliament, and the Manitoba act (1870) of the Dominion parliament. The executive power is vested in a lieutenant governor, appointed by the governor general of the Dominion in council, and an executive council of six members, appointed by the lieutenant governor, and responsible to the assembly. The legislature consists of the legislative council of seven members, appointed by the lieutenant governor for life, and the legislative assembly of 24 members, elected by districts for a term of four years. The sessions are annual. Every male person 21 years of age and upward, actually resident in the province, being a British subject or having taken

the oath of allegiance, is entitled to vote, upon having his name entered by the sheriff on the voters' list. Voting is *viva voce*. Qualified voters are eligible to office. The judicial power is vested in a court of queen's bench, county courts, and justices of the peace. The queen's bench consists of a chief justice and two puisne judges, appointed by the governor general in council, and has general jurisdiction. A county court, having inferior jurisdiction, is held for each county by a judge of the queen's bench without a jury. The records and journals of the legislature are kept and the laws are published in both English and French. Either language may be used in legal proceedings and in debates in the legislature. The common law does not prevail, but the general principles in force are the same as those recognized in Quebec, and are derived from French and Roman sources. Manitoba is represented in the Dominion parliament by two senators and four members of the house of commons (one from each county). The amount appropriated for the support of the government for 1872 was \$81,425, including \$7,000 for common schools. The salaries of the lieutenant governor and judges are paid from the Dominion treasury, besides which the province receives grants from the Dominion amounting in the aggregate to \$67,204 50 per annum. The public schools are under the charge of a board of education of 14 members, of whom half are Catholics and half Protestants, one of the members acting as superintendent of the Catholic and another of the Protestant schools. There are 40 common schools (20 Protestant and 20 Catholic), three Protestant female schools, several conventual academies and schools controlled by the Catholics, and three colleges, viz.: St. John's (Episcopal), St. Boniface (Catholic), and Kildonan (Presbyterian). Three weekly newspapers are published in the province (one each in English, French, and English and French), and there are 32 post offices. A majority of the population are Roman Catholics; the other principal denominations are Episcopalians, Presbyterians, and Wesleyan Methodists. The Roman Catholics have an archbishop (archbishop of St. Boniface), and the Episcopalians a bishop (bishop of Rupert's Land). There are 32 churches, viz.: 15 Episcopal, 2 Methodist, 4 Presbyterian, and 11 Roman Catholic.—Manitoba forms part of the territory granted in 1670 by Charles II. to the Hudson Bay company, which in 1811 sold a tract, including what is now the province, to Thomas Douglas, earl of Selkirk. Under his auspices a colony was established, which was sometimes called the Selkirk settlement, but more commonly the Red River settlement. The first body of colonists arrived from the highlands of Scotland in 1812, and a second party in 1815, and settled on the Red river near its confluence with the Assiniboin. Subsequently other settlers arrived, including a number of French Canadi-

an families in 1818; and as the colony gained permanence many who had been in the employment of the Hudson Bay company (mostly natives of the Orkney islands) and others connected with the fur trade, generally accompanied by Indian families, came in and took up their residence in the settlement. Until 1821, when the Northwest company was merged in the Hudson Bay company, the colonists suffered much from attacks by the employees of the former. In 1835 the Hudson Bay company bought back from the heirs of Lord Selkirk the territory granted to him in 1811, and established a more regular government than had previously existed, under the style of the governor and council of Assiniboia, giving it jurisdiction over the district embraced within a radius of 50 m. from Fort Garry. The officers were appointed by the company, the councillors being chosen from among the most influential citizens of the district. Settlements having been made W. of these limits, a provisional government was formed at Prairie Portage in 1867, with Mr. Spence as president and a council of eight members styled the council of Manitoba, but it dissolved before the annexation of the country to Canada. The act of parliament of 1867 creating the Dominion of Canada contemplated the acquisition by that government of the Hudson Bay territory, and Dec. 1, 1869, was subsequently fixed as the date of transfer. In the mean time an act of the Dominion parliament was passed providing for the temporary government of the entire region under the name of the Northwest territories, a measure respecting which the inhabitants of Assiniboia were not consulted. This fact, with other grounds of apprehension, caused much dissatisfaction. Upon the approach of William McDougall, who was to act as lieutenant governor of the Northwest territories, the French half-breeds, under the lead of Louis Riel, resolved to prevent his entrance into the settlement until some guarantee was received that the rights of the inhabitants would be respected; and from about Oct. 20, 1869, to Aug. 24, 1870, they held possession of the country. A provisional government was formed, with Riel as president and a council of 24 members (12 English and 12 French), and a bill of rights was adopted, the most prominent feature of which was a demand for representation in the Dominion parliament and for a local legislature elected by the people. These were conceded by the Manitoba act, which passed the Dominion parliament on May 20, 1870, and was accepted by the legislative assembly of Assiniboia on June 24, providing for the admission of the province from and after the day of the queen's proclamation annexing the Hudson Bay territory. The actual transfer of this region, delayed by the disturbances, took place July 15 in virtue of a royal proclamation of June 23. On Aug. 24 the 60th rifles, under Col. (now Gen.) Wolseley, entered Fort Garry, Riel having

previously vacated the place; and on Sept. 3 Mr. Archibald, the lieutenant governor of the province, arrived. The troops soon returned, and were replaced by Canadian militia.—See "The Red River Settlement, its Rise, Progress, and Present State," by Alexander Ross (London, 1856); "Narrative of the Canadian Red River Exploring Expedition of 1857," &c., by H. Y. Hind (2 vols., London, 1860); *Esquisse sur le Nord-Ouest de l'Amérique*, by Archbishop Taché (Montreal, 1869), translated by Capt. D. R. Cameron, "Sketch of the Northwest of America" (Montreal, 1870); "The Creation of Manitoba, or a History of the Red River Troubles," by Alexander Begg (Toronto, 1871); "Manitoba and the Northwest of the Dominion," by Thomas Spence (Toronto, 1871); and "Red River Country and its Resources," by J. J. Hargrave (Montreal, 1871).

MANITOBA, Lake, a body of water in the Northwest territories of Canada, intersected by the 51st parallel and 99th meridian, situated about 60 m. S. W. of Lake Winnipeg, into which it discharges through the Little Saskatchewan or Dauphin river, which expands near the middle of its course into St. Martin's lake. Lake Manitoba is about 120 m. long from N. N. W. to S. S. E., and has a breadth not exceeding 25 m.; area, about 1,900 sq. m. It is 40 ft. above Lake Winnipeg, and is navigable by vessels drawing 10 ft., though its outlet only admits small craft. At its N. extremity it receives through Water Hen river the waters of Winnipegosis or Winnipegosis, Dauphin, and Water Hen lakes, and at its S. extremity White Mud river. It abounds in fish. The name signifies "supernatural strait," the Indians attributing the peculiar agitation of the water in a portion of the lake to the presence of a spirit.

MANITOU, among some tribes of the American Indians, the name of any object of worship. "The Illinois," wrote the Jesuit Marest, "adore a sort of genius, which they call manitou; to them it is the master of life, the spirit that rules all things. A bird, a buffalo, a bear, a feather, a skin—that is their manitou." "If the Indian word manitou," says Palfrey, "appeared to denote something above or beside the common aspects and agencies of nature, it might be natural, but it would be rash and misleading, to confound its import with the Christian, Mohammedan, Jewish, Egyptian, or Greek conception of Deity, or with any compound of a selection from some or all of those ideas."

MANITOU, a county of Michigan, comprising the Beaver, Fox, and Manitou islands in Lake Michigan, off the N. W. coast of the lower peninsula; area, about 100 sq. m.; pop. in 1870, 891. The largest island is Big Beaver; the other principal islands are Great Manitou, Little Manitou, Little Beaver, Garden, Hog, South Fox, and North Fox. The surface is rough and the soil only moderately fertile. Capital, St. James, on Big Beaver island.

MANITOULIN ISLANDS, a group stretching E. and W. along the N. shore of Lake Huron from

Georgian bay to the N. peninsula of Michigan, the principal of which are Great Manitoulin or Sacred island, Little Manitoulin or Cockburn, and Drummond's. All but the last (which belongs to Chippewa co., Mich.) are included in Algoma district, Ontario, Canada; area, 1,183 sq. m.; pop. in 1871, 2,011, of whom 1,562 were Indians. Great Manitoulin, about 80 m. long by from 5 to 30 broad, is deeply indented by numerous bays, and has an elevated and rugged surface, abounding in fine scenery. The interior is densely wooded with pine, and in the E. part are several lakes. Little Manitoulin, about 10 m. in diameter, resembles Great Manitoulin in its general features. Drummond's island is about 20 m. long by from 2 to 15 broad, and has an irregular surface, covered with large masses of rock. It is separated from the mainland of Michigan by a strait scarcely a mile wide, which forms the principal passage for vessels bound to Lake Superior.

MANITOWOC, an E. county of Wisconsin, bordering on Lake Michigan, and drained by the Manitowoc, E. and W. Twin, and Sheboygan rivers; area, 612 sq. m.; pop. in 1870, 33,364. The soil is fertile and heavily timbered, pine lumber being the principal article of export. The chief productions in 1870 were 517,146 bushels of wheat, 92,881 of rye, 386,759 of oats, 30,176 of barley, 108,180 of potatoes, 80,410 of peas and beans, 44,421 lbs. of wool, 575,319 of butter, and 26,937 tons of hay. There were 4,460 horses, 9,351 milch cows, 11,017 other cattle, 16,403 sheep, and 11,200 swine; 15 flour mills, 21 saw mills, 3 woollen mills, 11 tanneries, 11 currying establishments, and 10 breweries. Capital, Manitowoc.

MANITOWOC, a city and the capital of Manitowoc co., Wisconsin, on Lake Michigan, at the mouth of Manitowoc river, and on the Milwaukee, Lake Shore, and Western railroad, 105 m. N. E. of Madison, and 75 m. N. of Milwaukee; pop. in 1860, 3,059; in 1870, 5,168, of whom 2,577 were foreigners. It has a good harbor and considerable trade, and contains several ship-building establishments, tanneries, and manufactories. There are a national bank, graded schools, a semi-weekly and four weekly (two German) newspapers, and five churches.

MANKATO, a city and the county seat of Blue Earth co., Minnesota, on the right bank of the Minnesota river, at the great bend, and on the St. Paul and Sioux City and Chicago and Northwestern (Minnesota division) railroads, 76 m. S. W. of St. Paul; pop. in 1870, 3,482; in 1874, about 6,000. It has an important trade and thriving manufactures. The sales of merchandise in 1873 amounted to \$2,225,000; the value of manufactures was \$950,000. The principal establishments are an extensive linseed oil factory, two flouring mills, two plough and agricultural implement factories, three foundries, and manufactories of woollens, bricks, furniture, and sash and doors. It contains two national banks, a private bank, 15 hotels, three public halls, a driving park and

fair grounds, one of the state normal schools, three large public school buildings, a denominational school, a public library, four weekly newspapers (one German), and 11 churches.

MANLEY, John, an American naval commander, born at Torbay, Devonshire, Eng., in 1734, died in Boston, Feb. 12, 1793. He settled at Marblehead, Mass., and was master of a merchantman. At the outbreak of the revolutionary war he had command of the armed schooner *Lee*, with which he cruised along the coast of Massachusetts bay, making captures of great value to the American army then investing Boston. Among these was an ordnance brig laden with heavy guns, mortars, and intrenching tools. He was commissioned as a captain by congress Aug. 22, 1776; and on June 1, 1777, his ship, the *Hancock*, 32 guns, in company with the *Boston*, 24 guns, Capt. Hector McNeil, encountered the British frigate *Rainbow*, 44 guns. While Manley was preparing for action, McNeil deserted him; and knowing the disparity in strength, Manley tried to escape, but was chased and captured. After a rigorous confinement in Halifax, he was exchanged, and in 1782 was put in command of the *Hague* frigate, which, after lying in a perilous position on a sand bank off Guadeloupe for three days, exposed to the fire of four British ships of the line, contrived to effect her escape. This exploit closed the regular maritime operations of the United States during the revolutionary war. Capt. Manley was subsequently tried by a court martial for the loss of the *Hancock*, but was honorably acquitted, while McNeil was dismissed from the service.

MANLEY (DE LA RIVIERE), Mary, an English authoress, born in Guernsey about 1672, died in London, July 11, 1724. She was the daughter of Sir Roger Manley, governor of the island of Guernsey, who was author of "History of the late Wars of Denmark" (1670), and *Commentarii de Rebellione Anglicana* (London, 1686). He carefully educated his daughter, and dying when she was young committed her to the care of his nephew, who, having already another wife, enticed her into a marriage with himself and abandoned her in London. The duchess of Cleveland, formerly a mistress of Charles II., then took her under her protection, but soon deserted her. In this emergency she began to write for the stage. Her "Royal Mischief," a tragedy represented at Lincoln's Inn Fields theatre in 1696, brought her into great literary repute, and she almost immediately became the centre of a brilliant circle of men of fashion. Although engaged in numerous intrigues, she soon produced her "Memoirs of the New Atalantis" (4 vols., London, 1709), a romance describing with much freedom of language and under feigned names the amours of several distinguished characters. The work created so much scandal that a criminal prosecution was commenced against the printer and publisher, to screen whom from punishment she voluntarily declared herself in

the court of king's bench the sole author. She was in consequence imprisoned for a time, but was subsequently released on bail. There were several later editions of the work, and it was translated into French. Upon the accession of the Tories to power in 1710, she resumed her position as a leader of fashionable profligacy, and employed her pen with effect in behalf of the ministry, under the direction, it is said, and with the approval of Swift. The "Vindication of the Duke of Marlborough" and other political pamphlets testify to her industry; and she also conducted the "Examiner" for some time after it had been relinquished by Swift, and frequently finished pieces begun by him. Among her remaining works are: the comedy of "The Lost Lover, or the Jealous Husband" (1696); "Lucius, the First Christian King of Britain" (1717), a tragedy, for which Steele wrote the prologue and Prior the epilogue; and a variety of ephemeral novels, memoirs, dramas, and poems. During the last few years of her life she lived with her printer, John Barber, an alderman of London.

MANLI, one of the most celebrated patrician *gentes* of ancient Rome, members of which held high offices in the state for about five centuries. The first of them who attained to the consulship was Cneius Manlius Cincinnatus, consul in 480 B. C., who fell in battle against the Etruscans.—**MARCUS MANLIUS CAPITOLINUS**, consul in 392 B. C., obtained his surname, according to Livy, from his defence of the capitol against the Gauls (about 390). Roused from sleep by the cackling of the sacred geese, he hastily collected a force, and repulsed the enemy, who had already gained the summit of the hill. He incurred the enmity of the patricians by his defence of plebeian debtors, was accused of aiming at the kingly power, and was for a time imprisoned. After his liberation, he instigated the plebeians to take up arms, but was arraigned for high treason before the people in the Campus Martius, was condemned to death, and was thrown from the Tarpeian rock (381). The Manlian *gens* determined that the name of Marcus should be conferred in future upon none of its members.—The Torquati and Vulsones were families of the Manlian *gens*.

MANN, Horace, an American educationist, born in Franklin, Mass., May 4, 1796, died at Yellow Springs, Ohio, Aug. 2, 1859. His father was a farmer in limited circumstances, and the education of the son was obtained entirely from the common district schools until the age of 20, when he fitted himself to enter the sophomore class of Brown university, at Providence, R. I., where he graduated in 1819. The theme of his oration, "The Progressive Character of the Human Race," foreshadowed his future career. After his graduation he was tutor in Latin and Greek in Brown university; subsequently he studied in the law school of Litchfield, Conn., was admitted to the bar in 1823, and opened an office in Dedham, Mass. In

1827 he was elected to the legislature, and immediately took an active part in the discussion of all important questions, especially such as related to morals, public charities, education, or the welfare of the poor, the ignorant, or unfortunate classes. He was foremost in procuring the enactment of laws for the suppression of intemperance and the traffic in lottery tickets, and for improving the system of common schools. The establishment of the state lunatic hospital at Worcester was due to his untiring efforts; he was chairman of the commission that erected the buildings, and in 1833 was chairman of the board of trustees of the institution. He continued to be returned by large majorities as a representative from Dedham till 1833, when he removed to Boston and entered into partnership with Edward G. Loring. At the first election after he became a citizen of Boston he was chosen a member of the state senate, and by re-elections was continued a senator for four years. In 1836 and again in 1837 he was president of the senate. While in the legislature he was a member and for part of the time chairman of the committee for the revision of the state statutes; and a large number of most salutary provisions were incorporated into the code at his suggestion. After the revised statutes were enacted, he was appointed in conjunction with Judge Metcalf to edit the work, for which he prepared the marginal notes and the references to judicial decisions.—At the organization of the Massachusetts board of education, June 29, 1837, he was elected its secretary, and for the next eleven years was annually re-elected. On accepting this office he withdrew from all other professional and business engagements and from politics. He introduced a thorough reform in the school system of the state; extensive changes in the law relating to schools were adopted; normal schools were established; school committees were paid; a system of county educational conventions was instituted; by means of "school registers" the actual condition of the schools was ascertained; and from the detailed reports of the school committees the secretary made valuable abstracts, which he embodied in his annual reports, forming several large volumes. In 1843, under the auspices of the board, but at his own expense, he visited Europe, to examine schools and to obtain such information as could be made available at home. His seventh annual report, made on his return, embodied the results of this tour. Many editions were printed, not only in Massachusetts, but in other states, sometimes by order of legislatures, sometimes by private individuals; and several editions were printed in England. This report, in which he advocated the disuse of corporal punishment in school discipline, involved him in a controversy with some of the Boston teachers, which resulted in the adoption of his views on discipline in the schools. The "Common School Journal," which he

edited and much of which he wrote, consists of 10 vols. 8vo. He published a volume of lectures on education, at the request of the board. He travelled over the state every year to hold conventions or teachers' institutes, at which he often taught during the day and lectured in the evening. His correspondence was voluminous. He was continually called upon for legal opinions in regard to school matters, which he always gave gratuitously; and whenever the cases were brought before the courts, his opinions were invariably sustained. He superintended the erection of two state normal school houses, and drew plans and gave directions for hundreds of others. He says in his "Supplementary Report" in 1848: "From the time when I accepted the secretaryship in June, 1837, until May, 1848, when I tendered my resignation of it, I labored in this cause an average of not less than 15 hours a day; from the beginning to the end of this period, I never took a single day for relaxation, and months and months together passed without my withdrawing a single evening from working hours to call upon a friend. My whole time was devoted, if not wisely, yet continuously and cheerfully, to the great trust confided to my hands." In the spring of 1848 he was elected to congress, to fill the vacancy caused by the death of John Quincy Adams. On June 30 he made his first speech in maintenance of the right of congress to legislate for the territories of the United States, and its duty to exclude slavery therefrom. In the ensuing November he was re-elected, receiving 11,000 out of 13,000 votes. During his first session he volunteered as counsel for Drayton and Sayres, indicted for stealing 76 slaves in the District of Columbia, and at the trial was engaged for 21 successive days in their defence. In 1850 he engaged in a controversy with Daniel Webster in regard to the extension of slavery and the fugitive slave law, and Mr. Webster's famous speech of March 7 of that year. At the ensuing election in November Mr. Webster's friends succeeded in the whig convention in defeating by a single vote Mr. Mann's renomination. He, however, appealed to the people as an independent anti-slavery candidate, and was re-elected. His last speech in congress was on the slavery question, Aug. 17, 1852. On Sept. 15 the state convention of the free-soil party of Massachusetts nominated Mr. Mann for governor, and on the same day he was chosen president of Antioch college, a new institution just established at Yellow Springs, Greene co., Ohio. Failing in the election, he accepted the presidency of the college, and continued there till his death, laboring with zeal and energy in the cause of education and philanthropy. He carried the institution through its early pecuniary and other difficulties, and satisfied himself by the experiment that a college for the common education of both sexes was practicable.—Besides his annual reports, his vol-

ume of lectures on education, and his voluminous controversial writings, he published "A Few Thoughts for a Young Man" (Boston, 1850); "Slavery: Letters and Speeches" (1851); "Lectures on Intemperance" (1852); and "Powers and Duties of Woman" (1853). See "Life of Horace Mann," by his wife, Mary Peabody Mann (Boston, 1865); his "Life and Works" (2 vols., Cambridge, 1867); and "Thoughts selected from his Writings" (1869). His lectures on education were translated into French by Eugène de Guer, under the title *De l'importance de l'éducation dans une république*, with a preface and biographical sketch by Laboulaye (Paris, 1873).

MANNA, the concrete juice of several species of *fraxinus*, or ash. Several of the ashes have flowers producing distinct petals, a character which some botanists consider a sufficient reason for placing them in a distinct genus, *ornus*, the flowering ashes. (See *ASH*.) The principal manna-bearing species are *F. ornus* and *F. rotundifolia*, natives of southern Europe and Asia Minor. The juice spontane-



The Manna Ash (*Fraxinus ornus*).

ously exudes in the summer months, from the punctures of an insect, *cicada orni*, but is increased by transverse incisions made for the purpose in the bark. The finer kind, known as flake manna, is from incisions in the upper part of the stem; it dries upon the tree in long flakes, which when removed have the under surface conformed to the trunk of the tree and the upper of irregular and somewhat stalactitic appearance. The coarser kinds are obtained near the roots of the tree, where the juice is collected in joints of the prickly pear (*opuntia*), or upon straw placed to receive it. It is an article of import for the sake of its medicinal qualities, and is obtained chiefly from Sicily and Calabria. The best is of a whitish or light yellow color in flakes and tears, while the poorer sorts are darker colored from the impurities with which they are mixed. It pos-

sesses a sweet, somewhat nauseous taste, and is soluble in water or in alcohol. From its boiling saturated solution it separates on cooling in crystalline form. It consists of a crystallizable sweet principle called mannite, which sometimes amounts to 75 per cent.; of true sugar; and of a yellow nauseous matter, which it is supposed gives to the manna its purgative property. For the sake of this it is used in medicine, and is commonly prescribed with other purgatives, as senna, rhubarb, magnesia, &c., the taste of which it conceals, while it increases their effect. When given alone, the dose for an adult is one or two ounces.—Various other saccharine exudations of plants are called manna; the manna of Briançon, which appears upon the twigs of the European larch (*larix Europæa*), is formed during the night, and soon disappears after the sun falls upon it. Another substance called manna is obtained by the Bedouin Arabs from the *tamarix mannifera*. After collecting it from among the twigs and leaves, they boil it, then strain it through cloth, and put it away in leathern bags to be eaten like honey with bread, as a delicate article of food. Dr. Robinson, in his "Biblical Researches in Palestine," mentions its being collected in small quantities by the Arabs of Mt. Sinai, and sold at very high prices to the Russians. According to Berthelot, the tamarisk manna from Sinai contains 55 per cent. of cane sugar, 25 of inverted sugar, and 20 of dextrine, &c. Manna from Kurdistan contains 61 per cent. of cane sugar, 16.5 of inverted sugar, and 22.5 of dextrine. The Sinai manna is soluble in water or alcohol, and the aqueous solution readily undergoes fermentation, yielding an alcohol possessing a butyric acid odor.—Though the name is probably derived from the Syriac *mano*, a gift, which was applied to the Scriptural manna, it cannot be proved that there is any relationship between the natural products designated by this name and the substance mentioned in Scripture (Heb. *man*) as miraculously supplied to the Israelites.

MANNERS, John. See *GRANBY*.

MANNHEIM, or *Manheim*, a town of the grand duchy of Baden, capital of the circle of the Lower Rhine, situated on the right bank of the Rhine, at the confluence of the Neckar with that river, 43 m. S. S. W. of Frankfort; pop. in 1871, 39,614. It is connected by steamers with Cologne and other places on the Rhine, and by railway with the principal towns of Europe. Goethe has appropriately called it "the pleasant, cleanly Mannheim." The regularity of the buildings, however, gives it a somewhat monotonous appearance. It consists of 11 straight streets, crossed by 10 other streets at right angles, forming 110 regular squares. It is divided into two parts by the great street leading from the palace to the suspension bridge over the Neckar. The principal public squares are the Plankenplatz and the Schillerplatz, where Schiller resided in the house called *zum Karlsberg*, and which is

adorned with fountains, and statues of Schiller, Dalberg, and Iffland. The theatre is a fine building, and in it Schiller's "Robbers" was first acted. Behind the palace, which contains collections of art, a large library, and a cabinet of natural history, are beautiful gardens, ending in a raised terrace upon the brink of the Rhine (*Rheindamm*). Along the banks of the Neckar, in the outskirts of the town, are handsome private gardens, and a broad avenue (*Plankenstrasse*) between the Heidelberg and Rhine gates is planted with trees. In spite of its fine position on two navigable rivers, the trade of the place was formerly unimportant; but of late years, owing to its railway connections, it has become the first commercial town in the grand duchy. The town was founded in 1606, and from 1720 to 1777 it was the capital of the Palatinate. It suffered severely in the thirty years' war, and was almost destroyed by the French in 1688 after a siege of 17 days. It was soon rebuilt, and was strongly fortified in 1699; but in the early part of the present century the ramparts were removed. During the wars of the revolution, the French attacked the town in December, 1794, and occupied it Sept. 20, 1795. During the long siege only 14 houses remained uninjured, and half of the palace was burnt. By the peace of Lunéville (1801), Mannheim was allotted to Baden.

MANNING, Henry Edward, an English Roman Catholic archbishop, born at Totteridge, Hertfordshire, July 15, 1808. He was educated as a member of the Anglican church at Harrow and Balliol college, Oxford, graduated in 1830, and was chosen fellow of Merton college and one of the select preachers in the university. In 1834 he was appointed rector of Lavington and Graffham in Sussex, and in 1840 archdeacon of Chichester. In 1842 he published his first work, on the "Unity of the Church," which classed him among the Puseyites. Two volumes of sermons published respectively in 1842 and 1846 attracted much attention. He also published three series of "Sermons preached before the University of Oxford" (1844, 1848, and 1850). The Gorham decision, leaving the doctrine of the effect of baptism an open question in the church of England, called forth a declaration from him, and other well known clergymen and laymen of the establishment, that, unless that decision was formally repudiated, it would be of binding force upon the English church. They strove to free that which they conceived to be the church of Christ from submission to a doctrinal decision given by the crown. Their attempt, however, was without result, and, with the exception of one or two protests, the action of the court was acquiesced in. Dr. Manning consequently gave up his preferments in 1851, and was received into the Roman Catholic church. He then went to Rome, where he remained till 1854. In 1857 he was ordained priest by Cardinal Wiseman, and ap-

pointed rector of St. Helen and St. Mary's, Bayswater, where he established a house of Oblates of St. Charles Borromeo, an association of secular missionary priests founded in the 16th century. About the same time the degree of D. D. was conferred on him by Pius IX., with the office of provost of the Roman Catholic diocese of Westminster and the rank of prothonotary apostolic. On the death of Cardinal Wiseman, Dr. Manning was nominated by the pope archbishop of Westminster, and consecrated June 8, 1865. He immediately set about promoting temperance, benevolent guilds, and elementary education among the poor Catholics of London, and purchased a site for a cathedral which was to be a memorial to Cardinal Wiseman, but declared that not one stone of this edifice should be laid till every poor child in his flock was provided with a Catholic free school. In 1871 he conceived the project of a Roman Catholic university, appealed to the public, created a fund, and organized a senate and a corps of professors. The institution was opened in Kensington Oct. 15, 1874. On July 2, 1869, he dedicated the pro-cathedral of Our Lady of Victories, Newland terrace, Kensington. At this time a controversy arose between Archbishop Manning and Bishop Dupanloup concerning the opportuneness of urging a definition of the doctrine of papal infallibility. The archbishop before departing for the œumenical council addressed a pastoral letter to his flock on the question of infallibility, which, with two others on the manner in which the deliberations of the council were conducted, and in elucidation of the defined dogma, was published, with the title of *Petri Privilegium* (London, 1871). In 1868 he addressed to Earl de Grey a remarkable letter on Ireland, in which he sets forth the mischief of English misrule in that country, and pleads strongly for justice. Since then he has been prominent in encouraging the "Home Rule" movement, and has taken an active part in denouncing the course pursued in Germany and Switzerland toward the Roman Catholic church. The principal works of Archbishop Manning, besides those mentioned, are the following: "The Temporal Mission of the Holy Ghost" (London, 1865); "The Temporal Power of the Pope in its Political Aspect" (1866); "England and Christendom" (1867); "The Fourfold Sovereignty of God" (1871); and "Sermons on Ecclesiastical Subjects" (1872).

MANNING, James, an American clergyman, born in Elizabethtown, N. J., Oct. 22, 1738, died in Providence, R. I., July 29, 1791. He graduated at Princeton college in 1762, became pastor of a Baptist church at Morristown, N. J., in 1763, and soon afterward in Warren, R. I., where he opened a Latin school. In 1763, at the request of an association formed for the purpose in Philadelphia, he proposed to several influential gentlemen of the denomination, assembled at Newport, the organization of "a seminary of polite literature, subject

to the government of the Baptists," and drew up a plan for such an institution. In 1764 the legislature granted them a charter, and in 1765 Mr. Manning, then but 27 years of age, was appointed "president and professor of languages and other branches of learning, with full power to act in these capacities, at Warren or elsewhere." The college went into operation at Warren in 1766, and on its removal to Providence in 1770, Mr. Manning went with it, and also became pastor of the first Baptist church in that place. During the revolution, when the college edifice was occupied as a military barrack, and afterward as a hospital, he was actively engaged in clerical duties, and also rendered important services to the patriotic cause. In 1783 he resumed his duties at the college, and in 1785 he was chosen to represent Rhode Island in congress, but after six months' service resigned. He resigned the presidency of the college in 1790, and his pastorate in April, 1791. (See BROWN UNIVERSITY.)

MANNITE, or **Mannitose**, also called sugar of manna and sugar of mushrooms ($C_6H_{14}O_6$), one of the glucoses, which was discovered by Proust, and its composition determined by Liebig. It exists in a great number of vegetables, and in the saccharine juices which have undergone viscous or lactic fermentation; it is generally extracted from manna, by digesting this substance with boiling alcohol, filtering while hot, and crystallizing; it should be purified by repeated crystallizations. On the transformation of starch into glucose by boiling with dilute sulphuric acid, it is also formed as a secondary product; and finally Linnemann in 1862 obtained it by the action of nascent hydrogen on glucose. Mannite is a solid substance, fusible between 160° and 165° C., and when once melted it can remain liquid at 140° C. It exercises no action on polarized light; it dissolves in $6\frac{1}{2}$ times its weight of water at 18° C., and in 80 parts of cold alcohol of the strength of 89 per cent., and much more readily in boiling alcohol. It is not soluble in ether, and absolute alcohol only dissolves 14 per cent. of its weight of mannite. Mannite crystallizes in anhydrous, thin, colorless, four-sided, silky prisms, which sometimes grow to a considerable size. It does not ferment except under very unusual conditions; does not reduce oxide of copper to the state of suboxide, but hinders the precipitation of sulphate of copper by the fixed alkalis, causing the formation of a beautiful blue-purple solution instead. In its chemical character, mannite is now regarded as a polyatomic (hexatomic) alcohol. Berthelot has shown its close analogy to glycerine, and has obtained a great variety of salts (called mannitanides) from it by heating mannite with different acids to a temperature of between 200° and 250° C. With a mixture of nitric and sulphuric acids it gives nitro-mannite. The nitrates of silver and mercury and the chlorides of silver and mercury are not reduced by mannite even at boiling heat; the acetate and ox-

ide of silver, however, if heated with mannite or left in contact with it at ordinary temperatures, yields a speculum of silver. Compounds of mannite with barium, calcium, strontium, &c., have been prepared by Ubaldini. In the presence of beer yeast mannite does not ferment; but if its solution be maintained at 40° C., after having been mixed with chalk and poor cheese, pancreatic tissue, or albumen, fermentation takes place, hydrogen and carbonic anhydride are disengaged, and alcohol is produced along with lactic and butyric acids.

MAN-OF-WAR BIRD. See FRIGATE BIRD.

MANOMETER (Gr. *μανός*, rare, and *μέτρον*, measure—measurer of rarity), an instrument employed to measure the pressure exerted by a confined portion of gas or vapor. The force is usually expressed in units of atmospheric pressure, called atmospheres, which are equal to 30 inches height of a column of mercury, or nearly 15 lbs. to the square inch. It will therefore be easily seen that mechanical ingenuity may devise several forms of the instrument. These various forms may be classified under three different general forms, which act upon different principles: 1, open-air manometer; 2, confined-air manometer; 3, metallic-spring manometer. An open-air manometer is shown in fig. 1. It consists of a vessel containing mercury in which a vertical tube *b* dips. The vessel also admits a tube, *a*, which connects with the boiler or chamber of compressed gas or steam. Calling Boyle's or Mariotte's law correct for all pressures, if the compressed gas has a density twice as great as it would have at the ordinary atmospheric pressure, it will raise the column of mercury in the tube *b* 30 inches; if five times as dense, the height of the mercurial column will be 150 inches, corresponding to 75 lbs. to the square inch. There may be many forms of open-air manometers, and the modifications are generally for the purpose of increasing the convenience of the apparatus by shortening the distance of the rise of the mercurial column.

The multiple-branch manometer, fig. 2, is a convenient form. An iron tube is bent upon itself, forming several U-shaped flexures, terminating in a vertical tube of glass, C D, furnished with a graduated scale, and open at the top. Mercury occupies the lower flexures and portions of the tube. When the compressed steam or gas is admitted, it presses upon the mercury in the first branch, A, forcing it down, and therefore up in the second branch. If it forces A down 10 inches, the difference of level in the two branches will be 20 inches. If there are 10 single or 5 double



FIG. 1.—Mercurial Manometer.

columns, the combined height of mercury supported in column will be 100 inches, or about 6.66 atmospheres. The compressed-air manometer,

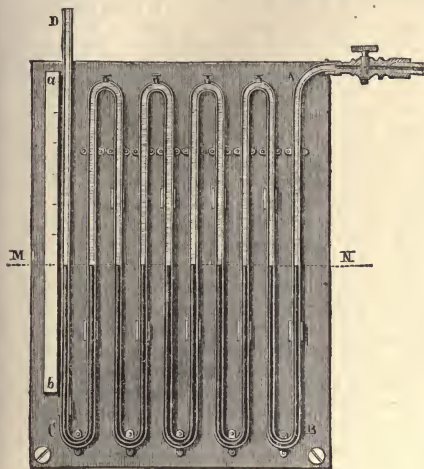


FIG. 2.—Multiple-Branch Manometer.

meter, fig. 3, is constructed upon the assumption that the confined air in the gauge expands and is condensed in accordance with Boyle's law. A is a U-shaped glass tube, one end of which communicates with the steam chamber, while the other end is closed. It has its flexure stopped with mercury, and a scale is attached, which is graduated by connecting the apparatus with an open-air manometer. It will be seen that as the mercury in A rises, the pressure is doubled for every reduction of the confined air to one half its volume, so that as the column approaches the top the graduated spaces must be nearer together. The metallic-spring manometer may be constructed

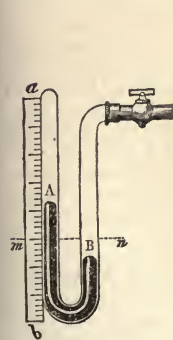


FIG. 3.—Compressed-air Manometer.

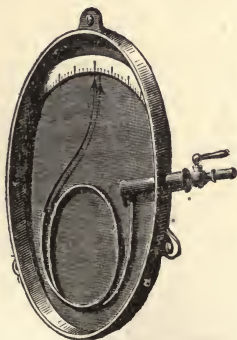


FIG. 4.—Bourdon's Pressure Gauge.

by having a piston press against a spiral spring, which is also connected with an index; or a flat copper tube (elliptic section), bent in a spi-

ral, may be connected at one end with the steam chamber, and at the other with an index, as in Burdon's pressure gauge, shown in fig. 4. Increased pressure causes the spiral to uncoil, by which the index is moved over the graduated arc.

MANRESA, a town of Spain, in the province and 30 m. N. N. W. of the city of Barcelona, near the left bank of the Llobregat river; pop. about 15,000. It is one of the most picturesque towns in Catalonia and the centre of a rich farming district, and has extensive manufactures of broadcloth, cotton, silk, tape, ribbons, gunpowder, and brandy. The streets are clean and well paved, but many of them are crooked and steep, and lined with quaint old-fashioned houses. There are some elegant churches and other public buildings, and in the neighborhood is the famous monastery of Montserrat, and the "cave of St. Ignatius," where Loyola passed some time in retirement before founding the society of Jesus. Manresa was taken by the French under Macdonald, March 30, 1811, when more than 800 buildings were burned, including hospitals and churches. This wanton act so incensed the Catalans, that they fell upon the rear of the French army on its march to Barcelona, and destroyed 1,000 men.

MANS, Le, a town of France, capital of the department of Sarthe, 118 m. S. W. of Paris, on the W. bank of the river Sarthe, here crossed by three bridges; pop. in 1872, 46,981. It is the seat of a bishop, consists of an old town and a new town, has a considerable trade in local products, and manufactures coarse woollens, yarns, lace, linen, paper, and soap. The cathedral of St. Julien, dating from the 12th century, is famous for its fine Gothic choir and painted windows. It is a place of great antiquity, having been founded in the 2d century by the Romans, and called Suindinum or Cenomani, after the Gallic people of the same name, in whose territory it was situated. During the war of the league Le Mans was captured by Henry IV.; and in December, 1793, it was the scene of the destruction of the Vendean army, when more than 10,000 persons were slaughtered. On Jan. 11 and 12, 1871, the French army of the Loire, under Gen. Chanzy, was here defeated and almost annihilated by Prince Frederick Charles of Prussia. The town itself was occupied by the Germans on Jan. 12.

MANSART, or **Mansard**. **I. François**, a French architect, born in Paris in 1598, died there in 1666. At the age of 22 he distinguished himself by the restoration of the hôtel Toulon. In 1624 he attracted the attention of Cardinal Richelieu, who commissioned him to erect the church of the Feuillants in the rue St. Honoré, and he was subsequently employed in many other great works in Paris and in the provinces. Among the numerous châteaux erected from his plans are those of Berny, Blérancourt, Choisy, Gèvres, Fresnes, and Maisons. He built the façade of the church of the

Minims in the place Royale, which he considered his finest work, and the church of Val-de-Grâce. He was fickle and unstable, often pulling down half-completed work, and rebuilding on new plans at enormous cost. He is said to be the inventor of the curb roof which bears his name, and which within a few years has become very common in the United States. **II. Jules Hardouin**, a French architect, nephew and pupil of the preceding, whose name he adopted, and son of Jules Hardouin, the painter, born in Paris in 1645, died at Marly in 1708. One of his first works was the château of Clagny, built for Mme. de Montespan, and since destroyed. Louis XIV. appointed him his architect, and the palace of Versailles, where Levan had begun alterations and additions, was built from Mansart's designs, which were largely directed by the vicious taste of his sovereign. Among his works, besides Versailles, are the places Vendôme, Louis XIV., and des Victoires, the gallery of the Palais Royal, and the dome and completion of the hôtel des Invalides, begun by Libéral Bruant. He was general superintendent of the royal buildings, arts, and manufactures, and acquired an immense fortune.

MANSEL, Henry Longueville, an English author, born at Cosgrove, Northamptonshire, Oct. 6, 1820, died there, July 30, 1871. He was educated at Oxford, became a fellow of St. John's college in 1842, was ordained priest in 1845, became Waynflete professor of moral and metaphysical philosophy in 1859, and was appointed dean of St. Paul's, London, in 1863. His first publication was a small volume entitled "Demons of the Wind, and other Poems" (1838). In 1851 he produced his *Prolegomena Logica*, a philosophical introduction to logic, and prepared an edition of Aldrich's *Artis Logice Rudimenta* (5th ed., 1860). In 1856 he delivered at Oxford a "Lecture on the Philosophy of Kant," which was printed, and designed by its brevity to attract readers who would be deterred by a more elaborate exposition. His most important work is the Bampton lectures delivered before the university of Oxford in 1858, and published under the title of "The Limits of Religious Thought" (5th ed., 1868). Mr. Mansel was one of the editors of the academical lectures of Sir William Hamilton (1859-'61), and the author of the article on "Metaphysics" in the 8th edition of the "Encyclopædia Britannica," which was reproduced separately in 1860 under the title "Metaphysics, or the Philosophy of Consciousness" (2d ed., 1866). He also published "The Limits of Demonstrative Science Considered," an inaugural lecture entitled "Psychology the Test of Moral and Metaphysical Philosophy," and "Philosophy of the Conditioned" (1866). A series of his lectures on "The Gnostic Heresies of the First and Second Centuries," with a biographical sketch, was published in 1874.

MANSFELD, an ancient noble family of Germany, taking its name from the castle of

Mansfeld, the original seat of the family, and now in the town and circle of Mansfeld in Prussian Saxony. **I. Peter Ernst**, count of Mansfeld, born July 20, 1517, died in Luxemburg, May 22, 1604. The greater part of his life was spent in the service of the emperor Charles V., and of his son Philip II. of Spain, who employed him in various important military and administrative capacities. He took part in the war against France in 1552, was captured, and remained a prisoner till 1557. Having been appointed governor of Luxemburg, he maintained that province in tranquillity at a time when the other provinces of the Netherlands were a prey to civil and religious commotions. In 1592 he succeeded the duke of Parma as governor general of the Netherlands; but two years afterward he retired to Luxemburg, with the title of prince of the empire. **II. Ernst**, natural son of the preceding, born in 1585, died near Zara, Dalmatia, Nov. 20, 1626. He was educated by his godfather, the archduke Ernest of Austria, and for his military services to the emperor Rudolph II. and Philip III. of Spain was legitimated by the former. But having been denied the dignity and estates of his father, which had been promised to him, he embraced Calvinism, and subsequently became one of the most active enemies of the house of Austria, by which he was called the Attila of Christendom. At the commencement of the thirty years' war he joined the elector palatine Frederick, elected by the Protestants king of Bohemia, and vigorously opposed the imperial forces in that country and also on the Rhine, where he ravaged the territories of the Catholic princes, and became a terror to his enemies. Though repeatedly beaten, he came forth so formidable from every defeat, that, when fighting for a desperate cause and lying under the ban of the empire, he found himself courted at the same time by the kings of Spain, France, and England, and the republics of Holland and Venice. In 1625 he succeeded in raising subsidies in England, and landed in Holland with considerable reinforcements, with the design of invading the hereditary possessions of the house of Austria. Defeated by Wallenstein at Dessau in April, 1626, he nevertheless pursued his march to Hungary, to effect a junction with Bethlen, the Protestant prince of Transylvania. But being unable to join his ally, he formed the design of reaching England by the way of Venice, and died on the march.

MANSFIELD, a town of Tolland co., Connecticut, on the New London Northern railroad, 25 m. E. of Hartford; pop. in 1870, 2,401. It is bounded W. by the Willimantic river, and is intersected by the Natchaug and its branches. Mansfield is chiefly noted for the manufacture of silk goods, containing eight establishments. There are also a manufactory of cotton goods, one of spool thread, and one of machinery. It was formerly noted for the growing of raw silk, which was introduced nearly 100 years ago; but

little is now produced. Mansfield is the seat of the state soldiers' orphans' home, and contains 7 post offices, 16 schools, and 4 churches.

MANSFIELD, a city and the capital of Richland co., Ohio, situated near the centre of the county, 65 m. N. by E. of Columbus; pop. in 1850, 3,557; in 1860, 4,581; in 1870, 8,029. It is compactly built on a beautiful and commanding elevation in the midst of a fertile and populous region. It has a number of handsome public buildings, including several of the churches and school houses, and the court house, which cost \$227,000. Many of the residences are elegant and surrounded by spacious grounds. Four railroads intersect here: the Sandusky, Mansfield, and Newark; the Pittsburgh, Fort Wayne, and Chicago; the Atlantic and Great Western; and the Mansfield, Coldwater, and Lake Michigan. The wholesale trade is important, amounting to about \$5,000,000 a year. The annual value of manufactures is about \$3,000,000, the principal articles being threshing machines, saw mill and foundry products, machinery, woollens, paper, boilers, carriages, furniture, flour, &c. There are three national banks, a state bank, an insurance company, water works on the Holly system, five public school houses, four weekly newspapers (one German), a library of 3,500 volumes, and 15 churches.

MANSFIELD, William Murray, earl of, a British jurist, born at Scone, Perthshire, March 2, 1705, died in London, March 20, 1793. He was the third son of Viscount Stormont, a Scottish peer of Jacobite tendencies, several of whose family became deeply involved in the rebellion of 1745. Removed to London at an early age, he was educated at Westminster school, and at Christchurch college, Oxford. In 1731 he was called to the bar, and being of a vivacious temperament, with the advantages of aristocratic connections and signal personal graces, he became a companion of wits and men of letters, and in particular gained the friendship of Pope. Almost at the outset of his career a new class of business, that of appeals from the court of session in Scotland to the house of lords, fell into his hands, and his emoluments were very large. His advance was rapid, and in 1743 he was appointed solicitor general, having the year previous entered parliament for Boroughbridge, for which place he was afterward returned in 1747 and again in 1754. As a legislator he displayed an eloquence "of which the clear, placid, and mellow splendor was never for an instant overclouded," and a depth and variety of knowledge which brought him into great prominence, while at the same time his peculiar political views exposed him to the attacks of Pitt, who frequently taunted his rival with his Jacobite connections and presumed sympathies. In 1747 he was one of the managers for the impeachment of Lord Lovat, and performed his part in so generous a spirit as to elicit praise from the prisoner himself. In 1754 Mr. Murray was appointed attorney gen-

eral, and in 1756 succeeded Sir Dudley Ryder as chief justice of the king's bench, and was created Baron Mansfield of Mansfield in the county of Nottingham. So important were his parliamentary services to his party, that extraordinary efforts were made by the duke of Newcastle to retain him in the house of commons, as a government leader. He was offered various sinecure offices with large salaries, and finally a pension of £6,000 a year, but steadily refused them all, regarding the situation of chief justice as preferable to the responsibilities and labors which the chancellorship, the premiership, or any other merely political office involved. Contrary to general usage, though not to precedent, he became when appointed chief justice a member of the cabinet; and in 1757, while temporarily holding the office of chancellor of the exchequer, at the request of the king he effected the coalition between Newcastle, Pitt, and Fox, which resulted in the celebrated first administration of Chatham. He participated on important occasions in the proceedings of the house of lords, where Lord Camden and subsequently Chatham became his chief antagonists. On questions affecting popular privileges or influence he showed a decided leaning toward an arbitrary government. The stamp act, which he aided in preparing, found in him an earnest and able advocate, and the doctrine of taxation without representation was by no one more persistently defended. In reference to the agitation in the North American colonies which preceded the repeal of the act, he held that the Americans must first be compelled to submit to the power of parliament, and must exhibit "the most entire obedience" before an inquiry could be had into their grievances. The utterance of opinions like these marked him out as an object of popular dislike and party violence, and for many years he was attacked with a vindictiveness which found its fullest expression in the letters of Junius, by whom "all the resources of the English language were exhausted in desolating and unpunished party libels on the chief justice of England." He nevertheless performed his judicial duties with dignity and courage; and on the occasion of the application of Wilkes in 1768 for the reversal of his outlawry, when public excitement had reached an almost unprecedented height, and the chief justice had been repeatedly threatened in anonymous letters, he announced to the partisans of Wilkes, who crowded Westminster hall, his contempt for the means that had been taken to deter the court from its duty. His unpopularity was still further increased by his direction to the jury in the trial of Woodfall, the publisher of Junius, "that the printing and sense of the paper were alone what they had to consider of." This attempt to restrict the right claimed by juries, in criminal prosecutions for libel, of determining whether a paper was a libel or not, brought upon Lord Mansfield the charge of arrogating to himself the functions of a le-

gislator rather than of an administrator of the law; and Junius in his letter of Nov. 14, 1770, said to him: "No learned man, even among your own tribe, thinks you qualified to preside in a court of common law; yet it is confessed that, under Justinian, you might have made an incomparable prætor." In the Gordon or "no popery" riots of 1780 his house in Bloomsbury square, with its valuable library of books and manuscripts, his private papers, furniture, and other valuables, was destroyed by the mob, from whose fury he only escaped by taking refuge in Buckingham palace. He bore these misfortunes with a calmness which seemed to disarm his enemies, declining any pecuniary compensation from the treasury; and during the remainder of his life parties generally united in a feeling of respect for his character and virtues. He retained his office of chief justice till 1788, having in the interim several times declined the chancellorship, and passed the last few years of his life in retirement. He left no children, and his title of earl of Mansfield, granted in 1776, descended to his nephew Viscount Stormont, to whom the greater part of his large property was bequeathed. The title of Baron Mansfield expired with him.—As a jurist the character of Lord Mansfield contrasts favorably with the timidity and narrow-mindedness which marked his legislative career; and when not influenced by political views his decisions were almost uniformly correct. Commencing his judicial career as a reformer, he aimed at expediting legal proceedings, and by diminishing the expenses of suitors, and preventing unnecessary delays, caused the business of the courts, though greatly increased, to be despatched with unexampled rapidity. Gifted with an acute and powerful intellect, and with a wonderfully retentive memory, he was in the habit of considering the intent and spirit of the law rather than its letter; but his eagerness to discourage technicalities, and preference of the principles of the civil law, occasionally led him to make the law instead of expounding it. In constructing a system of jurisprudence and adapting a progressive state of society to circumstances and cases entirely new, he was eminently successful; and English commercial law, particularly that branch of it relating to marine insurance, will be an enduring monument of his genius and industry. His conduct on the bench was marked by great dignity and amenity of manners, and in general he showed himself so worthy of his high office that Lord Chatham, for many years his determined political opponent, comparing him with two of the most illustrious British jurists, Somers and Holt, exclaimed: "I vow to God, I think the noble lord excels them both in abilities." Though opposed to liberal ideas, he was uniformly tolerant in matters of religious opinion. His arguments and decisions are preserved in Atkins's, Burrows's, Douglas's, and Cowper's reports; and his life has been written by John Holliday (1797), Henry Roscoe (1838), and Lord

Campbell in "Lives of the Chief Justices" (1849-'57). See also "Sketches of Statesmen who flourished in the Time of George III.," by Lord Brougham (1839-'43); and "The Judges of England," by Edward Foss (1848-'64).

MANSLAUGHTER. In the article **HOMICIDE**, it is said that felonious homicide is either manslaughter or murder. These two are distinguished from each other by the intent which causes or accompanies the act. If a homicide be not justifiable nor excusable, and yet be not committed with malice aforethought, it is manslaughter. It is quite certain that the intent need not be to kill; for while there must be a criminal intent to make a person amenable to law as a criminal, yet if one crime be intended, and in the act of committing it another of a higher character be also committed without intent, the criminal is responsible for this higher crime. The general principle laid down in respect to manslaughter is, that not only a positive intention to commit some crime, but mere negligence, may make one guilty. If any one take upon himself an office or duty requiring care or skill, he is liable for the want of either; and if death be the consequence of his ignorance or carelessness, he is guilty of manslaughter. So if one driving furiously run over and kill a person whom he did not see, or if one in command of a steamer or sailing vessel by reason of gross negligence run down a boat and some one in it be drowned, this would be manslaughter. So if any one, whether medical by profession or not, deal with another as a physician, and through gross want of care or skill kill him; or if any one charged with building a house of any kind construct it so badly that it falls and kills persons within or near it; or if in building he drop a stone upon some one passing below, and kill him; in all these cases he would be guilty of manslaughter, provided he were grossly negligent in the act causing the death. This is the essential question; thus, in the last case, if he were building in a place where few persons were, and it was by a rare occurrence that some one happened to be where the stone fell, it is said that there would be no such negligence as would make the killer responsible as a criminal; while, on the other hand, if it were a crowded thoroughfare, and the person dropping the stone gave no notice or warning and used no precaution to prevent mischief, the crime would then amount to murder. So if one ride a vicious horse, who kicks some one to death, it is no crime whatever if the rider did not know his character and did nothing by his carelessness to bring about the fatal result; but if he knew that the animal was vicious, and carelessly rode him near a crowd and exposed him to alarm likely to make him run into the crowd and do mischief, then the killing would be manslaughter. Sometimes it is said that if manslaughter be charged upon one on the ground of negligence only, without intent, this charge can be sustained only by evidence of the grossest negligence. It has been

held that the mere omission to do an act cannot, although death ensue, make the man guilty of manslaughter. But if the omission were of an act which was certainly a duty, and such an act that any reasonable person must know that its omission would be very dangerous to life, the principles of criminal law would lead to the conclusion that this might be manslaughter. Thus, a man employed to wall a shaft in a colliery, and whose duty it was to place a stage over the mouth of the shaft, having omitted this, and a man being thereby killed, the court of king's bench held him guilty of manslaughter. It seems to be agreed that if the act omitted were a legal duty, it would certainly amount to that crime. It should be added that the law always presumes (in the absence of clear proof to the contrary) that a man intended to do the thing he actually did, and intended the consequences which naturally and actually flow from his act; and this principle applies even where the act causes death. So a very nice distinction is taken in law between a *malum prohibitum* and a *malum per se*. Thus, if there be a law prohibiting the shooting of woodcocks before the 4th of July, one who shoots at one in June intends to break a law; but if, while thus shooting, by mere accident and without negligence, he should kill a man, this would be no crime, because shooting a woodcock at that season is an offence only because the law has made it so. But if he shoot at his neighbor's poultry, and by accident kill his neighbor, this is manslaughter; because the destroying his neighbor's property was an offence of itself, independently of municipal law.—But by far the most frequent and most difficult questions in practice are those which must be determined either by the means used to produce death, or by the presence or absence of previous hostile intention. It is a general rule, that if one kills another with a deadly weapon, it is more than manslaughter; and it has been said authoritatively, that whether the weapon used be a deadly weapon or not, is not a question of fact for the jury, but a question of law for the court. (See MURDER.) The other question, as to previous hostility, generally turns upon the preliminary question, whether the act was committed in "the heat of passion," or under sudden provocation. If one, being angry, attacks another, his anger is not an entire excuse. But if a quarrel and conflict ensue, and the assailant kills the man whom he attacked, while this is a felonious homicide, it is not murder, because there is an absence of that malice aforethought which is of the essence of murder; and therefore it is manslaughter. Still further would it be from murder if the party killing had been himself attacked. But neither would this excuse the act if it were not made necessary by the nature of the attack; but it would reduce the crime to manslaughter. Here, however, it is to be remembered that such a quarrel makes that to be only manslaughter which would

otherwise be murder, for no other reason than because it negatives the supposition of malice aforethought. If therefore this be proved, as if it be shown that the killer had a grudge against the deceased, and had manifested a violent hatred and intention to injure him, it might be inferred that he provoked the quarrel merely to give him the opportunity of gratifying his malice. In such a case the quarrel, instead of negating malice, would help to prove it; and therefore, of course, it could not have the effect of reducing the felony to manslaughter. So if there had been a quarrel and much provocation, and the quarrel had abated, and one of the parties withdrew and provided himself with a dangerous weapon, and returning killed the other, the excuse of "heat of passion" would not apply, for there would then be evidence of deliberate purpose. So, too, let the provocation be what it may, if there be no excitement or heat of passion, the killing will be deemed deliberate and intentional. Still, where there was much provocation, and no evidence of hostile purpose previous to the provocation, the killing itself would generally be deemed evidence of excited temper. There are other cases which the law regards as only manslaughter, without evidence of momentary excitement; partly because the law infers that from such a provocation there must be excitement; and partly, perhaps, because the party killed brought his death upon himself by his outrageous wrong. Thus, if a husband detects his wife in adultery, and instantly and purposefully takes either her life or her paramour's, it is only manslaughter. Not so, however, if he waits for a subsequent opportunity, for then the first reason wholly fails, and the killing becomes murder. In one English case, where a man had his pocket picked, and with the assistance of others threw the thief into a pond to punish him by a ducking, and the man was drowned, this was held only manslaughter.—Questions of this kind are so frequent, and at the same time so difficult, that the legislatures of many of the United States have endeavored to aid in their determination by discriminating between different classes and degrees of manslaughter, defining each degree, and affixing to it appropriate punishment. We have not space to speak of these in detail, but to illustrate the prevailing principles of classification refer to the statutes of New York. By these, four degrees of manslaughter are defined. The first degree, briefly stated, consists of killing without the purpose of death, when the deceased was engaged in perpetrating or attempting a crime less than felony, and where such killing would be, at common law, murder. Assisting in self-murder is manslaughter in the first degree, as also willfully killing an unborn quick child by injury to the mother, if it would be murder in case the mother died from the injury. The second degree consists in procuring abortion otherwise; killing in the heat of passion without the intent of death, but in a cruel and unusual man-

ner; or killing unnecessarily one attempting to commit a felony. The third degree is killing in heat of passion, without intent of death, but with a dangerous weapon; involuntary killing, by procurement or negligence of another, while the person killed is engaged in committing a trespass on property; suffering an animal known to be mischievous to go abroad without care, or keeping it without care, and thereby causing death; receiving wilfully or negligently so many persons into a boat or vessel as to cause death; racing while in command of a steamboat carrying passengers, bursting the boiler, and so killing; killing by a physician while in a state of intoxication. The fourth degree may be said to include all other modes of manslaughter, known as such at common law, and of a milder kind than the preceding.

MANT, Richard, an English bishop, born in Southampton in 1776, died in November, 1848. He was educated at Winchester and Trinity college, Oxford, and was chosen fellow of Oriel college in 1798. He became vicar of Great Coggeshall, Essex, in 1810; of St. Botolph's Bishopsgate, London, in 1815; and of East Horsley, Surrey, in 1818. In 1820 he was made bishop of Killaloe and Kilfenora, Ireland; was translated to Down and Connor in 1823; and received in addition Dromore in 1842. His most important works are: "An Appeal to the Gospel, or an Inquiry into the Justice of the Charge that the Gospel is not preached by the National Clergy" (Bampton lectures for 1812; 6th ed., 1816); "Sermons" (3 vols., 1813-'16); in conjunction with Dr. D'Oyly, an edition of the Bible, with notes for family use (republished in New York, under the supervision of Bishop Hobart, 1818-'20); "Book of Common Prayer, with Notes" (1820; 5th ed., 1840); "Happiness of the Blessed considered" (1833); "History of the Church of Ireland" (2 vols., 1839-'41); and *Horæ Liturgicæ* (1845). He also published volumes of poems.

MANTCHOORIA, or **Mantchuria**, the land of the Mantchoos, a country of Asia, a dependency of the Chinese empire, bounded N. by the Amoor river, which separates it from the Russian province of the Amoor, E. by the Usuri river, which separates it from the Russian district of the Amoor, S. by Corea and the Yellow sea, and W. by Mongolia, between lat. 40° and 53° 30' N., and lon. 118° and 135° E.; area about 400,000 sq. m.; pop. estimated at 3,000,000. Formerly the territory extended to lat. 58° N. and lon. 142° E.; but in 1858 China ceded to Russia all of Mantchooria N. of the Amoor and E. of the Usuri river. (See **AMOOB COUNTRY**.) A large part of this country is an uninhabited wilderness, and but little of it has been visited by Europeans. Nearly the whole of it is drained by the Amoor river and its branches. There are few lakes; the most important of them is Lake Khanka, which is 40 m. long and 25 m. broad. The province is traversed by several mountain chains. The Sih-hih-tih mountains ex-

tend from the boundary of Corea in a N. E. direction. The S. W. portion of this range bears the Mantchoo name of Shan Alin, and the Chinese name of Shangpe-shan or Long White mountains. The Ilykhoori Alin, in the north, forms three sides of the extensive valley of the upper Nonni, its eastern branch extending between the Amoor and the Songari to near their junction. The Khlengan mountains, running N. and S., and rising to a height of 15,000 ft., form part of the W. boundary. The greatest part of Mantchooria is covered by forests, the abode of wild animals, many of which afford valuable furs. Among them are bears, wolves, deer, the argali, and the dziggetai. The rivers and coasts abound in fish, among which carp, sturgeon, salmon, pike, and shell fish are especially plentiful. Among the birds of prey is a vulture which in size and fierceness rivals its congener the condor of the Andes. The southern part of Mantchooria is cultivated, and produces wheat, barley, pulse, millet, buckwheat, and silk. It also supports large herds of horses, cattle, and sheep. Ginseng and rhubarb are a government monopoly. The country is rich in iron and coal. The climate of the greater part of Mantchooria resembles that of Canada in the contrasts of temperature in different seasons; in summer varying from 70° to 80°, while in winter in the northern parts snow is abundant, the ground is frozen to a considerable depth, and the mercury ranges from 45° above to 10° below zero.—Mantchooria is divided into three provinces, Liaotung or Shinking, Girin, and Saghalin-ulu. Liaotung contains a population, according to the Chinese census of 1812, of 2,187,286; the others together about 1,000,000. Liaotung is, however, sometimes included in China proper. The three capital cities are Mukden or Shinyang, Girin, and Taitzikhar. Mukden is 380 m. N. E. of Peking, and is a large city surrounded by a wall 10 m. in circuit. Hingking, 60 m. E. of Mukden, is also a considerable city; it was formerly the family residence and the family burial place of the Mantchoo emperors of China. Kingchow, on the gulf of Liaotung, S. W. of Mukden, of which it is the port, carries on a considerable trade in cattle, provisions, and drugs. Its harbor is shallow and unsafe. Kaichow, on the E. side of the gulf, has a better harbor. Girin is a very extensive province, but thinly inhabited.—The Mantchoos belong to the Tungusic branch of the Mongolian division of mankind. They are of lighter complexion and heavier build than the Chinese, and some of them have florid complexions, blue eyes, aquiline noses, brown hair, and heavy beards. They have the same peculiar conformation of the eyelids as the Chinese, and resemble them closely in other respects; but their countenances are generally of a higher intellectual cast, and their character haughtier and more determined. They are the dominant race in the Chinese empire, being dispersed over the whole of it as officers and

soldiers, and the skill and energy with which they have governed their vast dominions since 1644, when they took possession of the throne, show them to be possessed of high qualities. During the same period they have greatly improved the condition of their own original country. When the Mantchoos conquered China, they imposed upon the subject people a portion of their dress and many of their usages. The mode of arranging the hair in a tail now in use by the Chinese was forced upon them by the Mantchoos, to whom it had long been familiar. On the other hand, they have adopted many of the customs of the Chinese. They began to be conspicuous in eastern Asia about the beginning of the 17th century, when after a long series of internal wars their tribes were united into one nation under a chieftain named Tien-ming, who in 1618 declared war against China, then ruled by the Ming dynasty. He overran and devastated the N. E. provinces, but died about 1627, leaving the prosecution of his design of conquest to his son Tien-tsung, who made alliances with rebels whose leaders pretended to be rightful heirs to the throne. With their aid he made himself master of Peking, and the last of the Chinese emperors, Hwai-tsung, having committed suicide in 1643, the Mantchoo chief took possession of the government. He died in 1644, and his son and successor Shunchi is regarded as the first emperor of the Mantchoo dynasty which still holds the throne. (See CHINA.)—An account of the country, by the archimandrite Palladius of Peking, was communicated to the British royal geographical society in 1872. (See TURANIAN RACES AND LANGUAGES.)

MANTEGNA, Andrea, an Italian artist, born near Padua in 1431, died in Mantua, Sept. 13, 1506. When quite young he was placed under the instruction of Francesco Squaricone. At the age of 17 he painted an altarpiece, and soon afterward the four evangelists for the church of St. Sophia at Padua. The works and reputation of the young artist induced the painter Jacopo Bellini to give him his daughter, Nicolasa, in marriage. His frescoes in the church degli Eremitani, representing the life of St. James and the legend of St. Christopher, and his St. Mark in the church of St. Giustina, were among his next works in Padua. He was invited about 1468 by Ludovico Gonzaga to Mantua. Between 1485 and 1490 he visited Rome at the invitation of Innocent VIII., and painted with almost miniature-like delicacy a series of frescoes in a chapel in the Belvedere, all of which however perished when Pius VI. destroyed the chapel toward the close of the last century to make room for his new museum. Of his works extant, the principal is the celebrated series representing in nine compartments the triumph of Julius Cæsar after his conquest of Gaul, originally painted for Ludovico Gonzaga, and which upon the downfall of that family were purchased by Charles I. of England. They were sold by

parliament with the rest of Charles's pictures, but were repurchased on the return of Charles II., and placed in Hampton court. They were engraved by the painter, and were copied in chiaroscuro by Andrea Andreani. Of his easel pictures the most famous is the *Madonna della Vittoria*, now in the Louvre, painted in commemoration of the victory gained by Gonzaga over Charles VIII. of France in 1495. Many other pictures by him are to be found in Italy and the large galleries of central Europe. Mantegna, according to Lanzi, engraved upward of 50 of his own designs, of which about 30 are known to collectors.

MANTELL, Gideon Algernon, an English geologist, born in Lewes, Sussex, in 1790, died in London, Nov. 10, 1852. He was educated as a surgeon, and attained a lucrative practice in his native town. Inclination, however, led him to devote much time to geological researches, and in a few years his discoveries in the Wealden formation, the extraordinary fossiliferous richness of which had been previously little known, gave him a high rank among living palæontologists. To his labors science is indebted for the discovery of four out of five of the genera of extinct dinosaurian reptiles, viz.: the *iguanodon*, the *hylæosaurus*, the *pelorosaurus*, and the *regnosaurus*; and his valuable museum collected from the Wealden and chalk formations, and which was purchased in 1839 for £5,000 by the trustees of the British museum, contains well preserved fossils of these, and also of many extinct fishes, insects, and plants. His geological drawings were bequeathed to Yale college, from which institution he received the degree of LL. D. in 1844. In 1825 he was elected a member of the royal society; in 1835 he received the Wollaston medal of the geological society, and in 1849 the royal medal of the royal society. In 1839 he removed to London, where he continued his medical practice and geological researches, and was remarkably successful as a lecturer. His chief scientific work separately published is "Fossils of the South Downs, or Illustrations of the Geology of Sussex" (4to, London, 1822). He is also the author of two popular treatises of great merit, "The Wonders of Geology" (2 vols., London, 1838), and "The Medals of Creation, or First Lessons in Geology" (2 vols., 1844), both of which have been translated into German, and of a number of other works illustrating the geology of the British isles and his own discoveries, including a "Pictorial Atlas of Fossil Remains" (4to, 1850). In Agassiz and Strickland's *Bibliographia Zoologia et Geologia*, 67 works and memoirs by Dr. Mantell are cited, besides which he wrote several papers on antiquarian and professional subjects.

MANTEUFFEL. I. Otto Theodor, baron, a Prussian statesman, born at Lübben, Feb. 3, 1805. He entered the civil service at an early age. In 1844 he was made a member of the council of state, and in 1847, in the first united diet, he was conspicuous as an ultra conservative.

During the administration of Count Brandenburg (1848-'50) he was minister of the interior. Upon the death of the count he was appointed minister of foreign affairs, and soon after, at the conference of Olmütz (November, 1850), brought about a settlement of the disputes between Austria and Prussia, by abandoning the position previously assumed by his state in North Germany. In December following he was appointed prime minister, still retaining his place as the head of the department of foreign affairs. In January, 1852, he became president of the council of state, and in 1858 was superseded and retired to private life. II.

Karl Rochus Edwin, a Prussian soldier, cousin of the preceding, born in Magdeburg, Feb. 24, 1809. He became aide-de-camp to the king in 1848, and rose to the rank of adjutant general, lieutenant general, and chief of the military cabinet. In 1865-'6 he became conspicuous as military and civil governor of Schleswig, by the invasion of Holstein, by his operations against Hanover, and by his vigorous proceedings against the city of Frankfurt. In the Franco-German war he commanded the first Prussian army corps before Metz, and on the capitulation of Bazaine (Oct. 27, 1870) he commanded the first German army against the French army of the North, capturing Amiens, Rouen, and Dieppe. In January, 1871, he was placed in command of the South German troops operating against the French army of the East under Bourbaki, and afterward under Clinchant, which he drove across the Swiss frontier, thus ending the war. In June, 1871, he was appointed commander-in-chief of the German army of occupation, his headquarters being at first at Compiègne, and afterward at Nancy, where he remained until the final evacuation of the French territory in 1873. He has received the rank of field marshal.—See *Aus dem Leben des General-Feldmarschalls Edwin Freiherrn von Manteuffel* (Berlin, 1874).

MANTINEA, one of the oldest and most powerful towns of Arcadia, on the borders of Argolis and the river Ophis. Its democratic political constitution was, according to Polybius, one of the best in antiquity. Like the other Arcadian towns, it acknowledged the Spartan supremacy prior to and during the Persian war. It was an ally of Sparta in the early part of the Peloponnesian war, but in 421-'20 B. C. formed a confederacy with Argos, Elis, and Athens, which was defeated and dissolved by the Lacedæmonians in 418. Though it became again an ally of Sparta, its increasing power rendered it obnoxious to the latter city, and in 385 the Spartans attacked and destroyed it by turning the waters of the Ophis against its walls. The Mantineans rebuilt their city after the overthrow of the Spartan supremacy by the battle of Leuctra in 371. They were prominent in the formation of the Arcadian confederacy, but soon abandoned it for an alliance with their ancient enemies the Spartans. To prevent this coalition Epaminondas marched

into the Peloponnesus, and Mantinea is chiefly celebrated as the scene of the great battle (362) between the Thebans and Spartans, in which he fell. It continued one of the most important towns of Arcadia till the time of the Achaean league, which it at first joined, but subsequently deserted for the Aetolian confederacy, an event which occasioned the Cleomenic war. In 226 it was surprised and terribly chastised by Aratus, and in 222 it was plundered by Antigonus Doson, and its name changed to Antigonea, which it bore till its ancient appellation was restored by the emperor Hadrian. The ruins of Mantinea are visible at the modern village of Paleopoli, in a bare plain, 8 m. N. of Tripolitza; they consist of the remains of the theatre and three courses of masonry of the entire circuit of the walls, which were elliptical, 1,250 yards in diameter, with 10 gates and 118 towers.

MANTIS (Fabr.; Gr. *μάντις*, a soothsayer), a genus of orthopterous insects of the group of graspers (*raptoria*). In the best known species, *M. religiosa* (Linn.), the head is triangular, the eyes large, the prothorax very long, and the body narrowed and lengthened; the anterior feet are armed with hooks and spines, and the shanks are capable of being doubled up on the under side of the thighs. When at



Mantis religiosa.

rest it sits upon the four posterior legs, with the head and prothorax nearly erect, and the anterior feet folded backward; from this singular attitude it is called the praying mantis or soothsayer (the *prie-Dieu* of the French). The insects are slow in their motions, waiting on the branches of trees and shrubs for some insect to pass within their reach, when they seize and hold it with the anterior feet, and tear it to pieces. They are voracious, sometimes preying upon each other; they are beneficial to man in destroying caterpillars and other insects injurious to vegetation. The eggs are deposited in two long rows, protected by a parchment-like envelope, and attached to the stalk of a plant; the nymph is as voracious as the perfect insect, from which it differs principally in the less developed wings. They are most abundant in the tropical regions of Africa, South America, and India, but are found in the warmer parts of North America, Europe, and Australia. In the south of France it was once a popular belief that this insect, if spoken to, would point out the way to a lost child, and in central and south Africa it is still regarded with veneration. The American species is the *M. Carolina*.

MANTUA (Ital. *Mantova*). I. A N. province of Italy, formerly included in Lombardy, but lately attached to Venetia, bordering on Brescia, Verona, Rovigo, Modena, Reggio, Parma, and Cremona; area, 855 sq. m.; pop. in 1872, 288,942. It is an extensive plain, in many parts swampy and insalubrious, but has been much improved by draining, and is generally very fertile. It is watered by the river Po and its affluents the Mincio and Oglio, and its principal products are grain, flax, silk, hemp, rice, fruits, and wine. The province is divided into the districts of Gonzaga, Mantua, Ostiglia, Revere, and Sermide, and embraces the former duchy of Mantua. II. A city, capital of the province, 80 m. E. S. E. of Milan and 22 m. S. S. W. of Verona, on an island in the middle of a lagoon formed by the Mincio; pop. in 1872, 26,687. The swamps and marshes surround-

ing Mantua, in connection with the formidable works which guard all its approaches and enclose it on every side, once constituted its most important defences, and made it so strong that it was deemed impregnable by any means but famine; but of late years the marshes have been partially drained and diked, and the salubrity of the city is greatly improved. The communication between the island and the mainland is by several bridges, the longest of which, the ponte di San Giorgio, forms the principal approach to the city. The latter is entered by five gates, one of which, the porta Mulina, presents a curious specimen of ancient engineering. Mantua has a desolate appearance, except in the central parts, where there is commercial activity; but it contains many fine streets, the via Larga being the widest avenue. Among the finest squares are the piazza di Virgilio, sur-



Mantua.

rounded by elegant houses; the piazza delle Erbe, where the market is held; the esplanade or piazza di San Pietro; and the piazza del Argine, with a marble pillar crowned by a bust of Virgil. Great masses of buildings, consisting of feudal castles with their battlemented turrets and Lombard arches, extend from the porta di San Giorgio to the piazza Delpurgo, and include the ancient palatial castle (*castello di Corte*) of the Gonzagas, now used partly as a prison and partly for public offices. Adjoining it is the immense structure begun in 1302, now comprising the so-called palazzo Imperiale, palazzo Vecchio, and corte Imperiale, containing about 500 apartments, and mainly indebted for its present beauty to the genius of Giulio Romano, whose works as a painter and architect form the greatest artistic glory of the city, but are nowhere displayed to greater advan-

tage than in the decorations of this palace. The palazzo del Te, outside of the city, originally intended for ducal stables, also grew up under the genius of Romano to the dimensions of a vast and magnificent building. The principal churches are the cathedral of St. Peter, Sant' Andrea, and Sta. Barbara, all more or less rich in paintings, particularly the last, which also contains in its sacristy a golden vase attributed to Benvenuto Cellini. San Maurizio contains the "Martyrdom of St. Margaret," one of the finest works of Ludovico Carracci. The shambles (*beccheria*) and fish markets (*pescheria*) were planned and built by Giulio Romano. Mantua is a bishop's see, erected in 808, and contains a number of educational and charitable institutions, a botanic garden, a museum of antiquities, a library of about 80,000 volumes, an academy of science and fine arts

(Virgiliana), now chiefly used as a school of drawing, a chamber of commerce and industry, a *monte di pietà*, a general house of correction, a military arsenal, a theatre, and an elegant amphitheatre. The manufactures, including silk, linen, sail cloth, woollens, soap, paper, and parchment, are limited, and the principal article of trade is silk.—Mantua is supposed to have been founded by the Etruscans 400 years before the building of Rome, and it came under Roman power in 197 B. C. It derives its chief classical celebrity from associations with Virgil, who has celebrated Mantua as the place of his birth in several passages of his works. Charlemagne gave it its first fortifications, which in modern times were completed in their present form by the Austrians. In the middle ages it was one of the most important cities in Italy, and was greatly improved and embellished by the Gonzaga family, under whom it became with the surrounding territory a duchy. (See GONZAGA.) In 1630 it was seized by the imperialists and subjected to terrible calamities, from which the city has never recovered. In 1796–7 Bonaparte, hopeless of reducing the fortress by force of arms, kept it under strict blockade for five months till famine compelled it to capitulate, Feb. 2, 1797. The Austrians regained it in July, 1799, and the French again, after Marengo, in 1800. It belonged to the kingdom of Italy till 1814, when it was restored to Austria. In July, 1842, the Jews, who formed a considerable portion of the population, then confined in a separate quarter (*ghetto*), were subjected to great persecutions. In the war of Sardinia with Austria in 1848, the victory depended on the possession of Mantua; it was blockaded for several months by the troops of Charles Albert, till his defeat by Marshal Radetzky in the battle of Custoza (July 25). During the wars of 1859 and 1866 Mantua was again of high strategical importance, as one of the most formidable strongholds of Austria. By the treaty of Villafranca, July 11, 1859, it was excepted from the territory ceded to the king of Sardinia; but it was annexed to Italy Oct. 11, 1866.

MANUEL, the name of two Byzantine emperors. **I. Manuel I. Comnenus**, born about 1120, died Sept. 24, 1180. The valor which he had displayed against the Turks induced his father John II. (Calo-Joannes) to bequeath the crown to him rather than to his elder brother Isaac, and he succeeded him in 1143. He was at once involved in wars both in the East and the West, which lasted with brief intermissions through his reign. In 1144 he subjected Raymond, the Latin prince of Antioch. In 1145 he defeated the sultan of Iconium in successive pitched battles. In 1147 he promised his aid to the new crusade headed by Louis VII. of France and Conrad III. of Germany; and he allowed them a passage through his dominions, but gave secret information to the Turks. In 1148 he began the most important war of his reign with Roger, the Norman king of Sicily,

who had taken Corfu and prepared to invade Greece. He formed an alliance with the Venetians, who within a year joined him before the fortress of Corfu, which was surrendered after an obstinate siege. He was prevented from invading Sicily by hostilities of the Serbians and Hungarians, instigated by Roger, the former of whom were vanquished in two campaigns, but the latter protracted the war till 1152. In that year he suffered a reverse from the Turks in Cilicia, but his general John Ducas gained so great successes in southern Italy that Manuel conceived the project of reuniting the eastern and western empires. The defeat of Alexis, the successor of John Ducas, by William, the successor of Roger, soon followed; the Sicilian admiral Maius routed the Greek fleet off Negropont, and advanced toward Constantinople; and Manuel therefore accepted an honorable peace in 1155. Those Greek prisoners who were silk weavers were retained in Italy, and gave origin to the Italian silk manufactures. In the following years he waged successful wars with Raymond, prince of Antioch, and Az ed-Din, the Turkish sultan. A new war soon broke out with Gejza II., king of Hungary, which was terminated by the defeat of the Hungarians. In 1176 he was defeated by Az ed-Din in the mountains of Pisidia, and was obliged to sign a disadvantageous peace. By breaking the treaty and renewing the war he obtained honorable terms. Depressed by this disastrous expedition, he never recovered his former military enterprise and ambition. **II. Manuel II. Palæologus**, born in 1348, died July 21, 1425. At the death of his father John V. in 1391, he fled to Constantinople from the court of the sultan Bajazet, with whom he had been left as a hostage. The consequence was a war with Bajazet, in which Manuel was supported by an army of Hungarians, Germans, and French. The allies, under the command of Sigismund, king of Hungary and afterward emperor of Germany, were defeated in the bloody battle of Nicopolis in 1396, with the loss of 10,000 men. Constantinople was besieged, and its fall seemed impending, when the conquests of Tamerlane diverted the arms of the sultan. Manuel visited Italy, France, England, and Germany, vainly seeking assistance from the western princes. In the conflict between the Tartars and the Turks, he acted with diplomatic skill, and secured peace to his empire. He sent ambassadors to the council of Constance with instructions to urge a union of the Latin and Greek churches; but his real object was only to obtain aid from the kingdoms of the West, and to alarm the Turks by the negotiations.

MANUMISSION, in Roman antiquity, the form by which slaves, or other persons not *sui juris*, were released from their condition. There were three modes of effecting a legal release, by *vindicta*, census, or will, by any of which the freedman might obtain the rights of a citizen. The *vindicta* was the oldest, and as

follows: The owner brought his slave before the magistrate, and stated the grounds on which he intended his manumission. The lictor laid a rod on the head of the slave, and declared him free by right of the Quirites; the master, who in the mean time held the slave, pronouncing the words, "I wish this man to be free," turned him round, and let him go (*emisit e manu*, whence the term). The magistrate then declared him to be free. The manumission by census was effected by the slaves giving in their names at the lustral census at the bidding of their masters. By will a slave could be made free conditionally or unconditionally, or free and an heir to the testator. Laws at different periods enacted restrictions, such as limiting the proportion of slaves a man might manumit in his will and preventing manumission to defraud creditors. The act of manumission established the relation of patron and freedman between the manumitter and the manumitted; and if the former was a citizen, the latter became a member of his *gens*, and assumed his family as well as personal name, to which he added some other as surname, commonly that by which he was previously known.

MANURES. See AGRICULTURAL CHEMISTRY, vol. i., p. 197.

MANUSCRIPT (Lat. *manu scriptum*, written with the hand), in bibliography, a written book or document, in distinction from a printed one. (For the various materials that have been used for this purpose, see BOOK, PAPER, and PAPERUS.) In form, ancient manuscripts were either rolls (*volumina*) or flat pages like our printed books (*codices*). The Egyptian papyri are usually in rolls of an indefinite length, according to the subject matter, but some of the smaller ones are flat. Leaves of parchment were sometimes interspersed with papyrus leaves to strengthen the latter. Parchment and vellum manuscripts also were originally in rolls, but codices were made as early as the 3d and 4th centuries. The pages of the latter are usually quarto, rarely folio or octavo. Some of the oldest are square, but they are generally a little higher than broad. The manuscripts of the Mexicans were sometimes in rolls, but more generally in book form, the paper, which was continuous, being folded like a chart, with a tablet or cover of wood at each end. As the writing was on one side only, each page could thus be referred to separately, as in a modern book.—The transcribing of manuscripts was committed by the Greeks and Romans principally to slaves, who were esteemed of great value when they excelled in the art. They are called by Horace *scriptores librarii*, and in later times *antiquarii*. Becker thinks that the latter term was applied, after the cursive writing came into use, to those who copied books in the old uncial characters. There were also at Rome professional copyists, some of whom were women. About the 5th century associations of scribes, who worked

under stringent rules, were formed. In the middle ages copying was almost exclusively in the hands of ecclesiastics, who were called clerks (*clerici*). In all the principal monasteries a room called *scriptorium* was devoted to the *scribæ* or *scriptores*, where they could pursue their work in quiet. The text was sometimes read aloud by a *dictator*. The manuscript when finished was corrected by one appointed for the purpose, and it then passed into the hands of the *miniator*, who added the ornamental capitals and other embellishments. The earliest form of illumination was the use of different colored inks. The Egyptian papyri are generally written in red and black, but some are ornamented with other colors and with gilding, and some with vignettes, many of which are remarkable for the delicacy and beauty of their execution. In the vellum manuscripts of the 4th and 5th centuries the initial letters, the first words, or the first three or four lines of books are often in red ink, while the body of the work is in black. Other colors, as purple, blue, green, and cinnabar, were used early, and sometimes the entire manuscript was written in gold or silver letters on purple, blue, or rose-colored parchment. One of the most interesting examples of this is the *Argenteus Codex* in the library of the university of Upsal, written in silver letters, with the initials in gold, on violet-colored vellum. (See ARGENTÆUS CODEX.) The *Codex Aureus* of the royal library at Stockholm is a Latin manuscript of the Gospels, written in Gothic characters of gold on leaves of vellum alternately white and violet; it belongs to the 6th century. In the earlier Greek and Latin manuscripts there was no distinction of initial letters, but after the 4th century the first letters of books and chapters, and sometimes of each page, were made larger than the body of the letters, and were frequently profusely ornamented in design and color. In the 6th and 7th centuries initial letters were one or two inches high, and from the 7th to the 10th century were often a foot high, covering nearly the whole page. The Irish manuscripts of this period exhibit some of the most extraordinary work of this kind, the initials being formed of complicated interlaced patterns, and ornamented with figures of men, birds, animals, and grotesque deformities. One of the finest specimens of this class is the copy of the Gospels known as the Book of Kells, in the library of Trinity college, Dublin; it dates from the 7th century. The early Franco-Gallie manuscripts show a distinct style of illumination of initial letters in arabesque patterns with elegant foliage. In the middle ages colored and gilded designs and illustrations were so common that it was said: *Hodie scriptores non sunt scriptores, sed pictores*. Miniatures and pictures were early introduced into manuscripts. Pliny says that physicians painted representations of medicinal plants in their treatises, and that Varro illustrated his biography of

eminent persons with 700 portraits. In the imperial library at Vienna is a Roman calendar with allegorical figures of the months, supposed to have been executed in the first half of the 4th century; and in the same library is a copy of Dioscorides, dating from the beginning of the 6th century, containing numerous miniatures and illustrations of plants. There is also a fragment of a Virgil of the 4th century in the Vatican library, which is profusely ornamented with miniatures. The *Codex Cottonianus Geneseos*, the remains of which are in the British museum, had originally 250 miniatures, each about four inches square. This manuscript, which contained fragments of the Old and the New Testament in 165 quarto leaves, is said by tradition to have belonged to Origen in the first half of the 3d century, but it is now ascribed to the 6th century. It was almost entirely destroyed at the burning of the Cottonian library in 1731. In the Ambrosian library in Milan is a part of a very ancient copy of the *Iliad* illustrated with miniatures. The Persians, Hindoos, Chinese, and other eastern nations illuminated their manuscripts, but no very ancient specimens are known to be extant. Some of the Arab manuscripts are remarkable for the beauty of their arabesque ornamentation, and for the absence of any representations of living figures, the painting of which is forbidden by the Koran.—The most ancient manuscripts extant are the papyrus rolls from the tombs of Egypt, where the dryness of the climate and of the sand beneath which they were buried preserved them in an almost perfect condition for thousands of years. They may be considered under two general heads, the Egyptian proper and the Greek. Of the former three classes are found, written respectively in the hieroglyphic, the hieratic, and the demotic or enchorial characters. The first are mostly books of a religious and moral character, the most common one being the ritual of the dead. Hieratic manuscripts contain the great body of Egyptian literature. One of the oldest known is the *Prisse papyrus* in the national library at Paris, a moral treatise written by Prince Ptah-hotep of the 5th dynasty, the beginning of which is placed by Mariette at 3951 B. C. Manuscripts in the demotic character, consisting principally of contracts, bills of sale, accounts, letters, &c., are found dating from the beginning of the 9th century B. C. to about the 2d century A. D. (See EGYPT, LANGUAGE AND LITERATURE OF.) The Greek papyrus manuscripts found in Egypt are of two classes: books proper, written in uncial letters, and public and private documents, in cursive characters. Among the oldest specimens of the first class extant are fragments of a treatise on rhetoric and a part of the 13th book of the *Iliad*, written in the 3d century B. C., in the national library at Paris; and among the papyri recovered from Herculaneum is a fragment of a treatise on music by Philodemus, of the 1st century

B. C. Among the oldest cursive manuscripts is a petition to Ptolemy Philometor, written in the 2d century B. C., also in Paris.—The invention of parchment is usually ascribed to the reign of Eumenes II., king of Pergamus, in the 2d century B. C., but manuscript rolls of brown leather of the 14th dynasty have been found in the Egyptian tombs, and rolls of white parchment made more than 1,000 years before Eumenes are preserved in the British museum. A recently discovered leather manuscript of the ritual of the dead, written in black and red hieratic characters, is now in the Berlin museum. It is ascribed to the 18th dynasty. Of parchment manuscripts made since the beginning of the Christian era, probably the most ancient one in existence is the palimpsest of Cicero's *De Republica* in the Vatican library, supposed by its discoverer, Cardinal Mai, to have been written in the 2d or 3d century. (See PALIMPSEST.) It contains 302 pages, and is written in double columns of 15 lines each, in fine Roman uncials, with no division of words. Over it is St. Augustine's commentary on the Psalms. In the library of Verona is a palimpsest Virgil of the 3d or 4th century, with the Gregorian commentary on Job written over it in a script of the 8th century. The same library possesses the celebrated palimpsest of the 4th century, containing the greater part of the Institutes of Gaius, overwritten with a copy of the letters of St. Jerome. A palimpsest in the British museum contains, under fragments of the sermons of St. Chrysostom, written in Syriac, the only extant portion of the annals of Licinianus, in uncial characters of the 4th century. In the Vatican are a Terence of the 4th or 5th century and a fragment of a *Salust* of the 5th. The Laurentian library of Florence possesses the celebrated Medicean Virgil, the most perfect of the ancient copies existing, wanting only a part of the *Bucolics*. It contains 440 leaves, is written on both sides, and the first three lines of each book are in vermilion. It belongs to the 4th or 5th century.—No authentic manuscripts or fragments of manuscripts of the Bible of the first three centuries are known to exist. The *Codex Sinaiticus*, which was obtained by Tischendorf in 1859 from the convent of St. Catharine on Mt. Sinai, and is now in the imperial library at St. Petersburg, is generally conceded to have been written about the middle of the 4th century. Tischendorf considers it not improbable that it is one of the 50 copies of the Scriptures which the emperor Constantine in the year 331 directed to be made for Byzantium, under the care of Eusebius of Cæsarea. It consists of 345½ leaves of very fine vellum, made probably from the skins of antelopes or of asses, each leaf being 14½ inches high by 13½ inches wide. The writing on each page is in four columns (excepting in the poetical books of the Old Testament, where there are but two), each containing 48 lines of from 12

𐀀𐀁𐀂𐀃𐀄𐀅𐀆𐀇𐀈𐀉𐀊𐀋𐀌𐀍𐀎𐀏𐀐𐀑𐀒𐀓𐀔𐀕𐀖𐀗𐀘𐀙𐀚𐀛𐀜𐀝𐀞𐀟𐀠𐀡𐀢𐀣𐀤𐀥𐀦𐀧𐀨𐀩𐀪𐀫𐀬𐀭𐀮𐀯𐀰𐀱𐀲𐀳𐀴𐀵𐀶𐀷𐀸𐀹𐀺𐀻𐀼𐀽𐀾𐀿𐁀𐁁𐁂𐁃𐁄𐁅𐁆𐁇𐁈𐁉𐁊𐁋𐁌𐁍𐁎𐁏𐁐𐁑𐁒𐁓𐁔𐁕𐁖𐁗𐁘𐁙𐁚𐁛𐁜𐁝𐁞𐁟𐁠𐁡𐁢𐁣𐁤𐁥𐁦𐁧𐁨𐁩𐁪𐁫𐁬𐁭𐁮𐁯𐁰𐁱𐁲𐁳𐁴𐁵𐁶𐁷𐁸𐁹𐁺𐁻𐁼𐁽𐁾𐁿𐂀𐂁𐂂𐂃𐂄𐂅𐂆𐂇𐂈𐂉𐂊𐂋𐂌𐂍𐂎𐂏𐂐𐂑𐂒𐂓𐂔𐂕𐂖𐂗𐂘𐂙𐂚𐂛𐂜𐂝𐂞𐂟𐂠𐂡𐂢𐂣𐂤𐂥𐂦𐂧𐂨𐂩𐂪𐂫𐂬𐂭𐂮𐂯𐂰𐂱𐂲𐂳𐂴𐂵𐂶𐂷𐂸𐂹𐂺𐂻𐂼𐂽𐂾𐂿𐃀𐃁𐃂𐃃𐃄𐃅𐃆𐃇𐃈𐃉𐃊𐃋𐃌𐃍𐃎𐃏𐃐𐃑𐃒𐃓𐃔𐃕𐃖𐃗𐃘𐃙𐃚𐃛𐃜𐃝𐃞𐃟𐃠𐃡𐃢𐃣𐃤𐃥𐃦𐃧𐃨𐃩𐃪𐃫𐃬𐃭𐃮𐃯𐃰𐃱𐃲𐃳𐃴𐃵𐃶𐃷𐃸𐃹𐃺𐃻𐃼𐃽𐃾𐃿𐄀𐄁𐄂𐄃𐄄𐄅𐄆𐄇𐄈𐄉𐄊𐄋𐄌𐄍𐄎𐄏𐄐𐄑𐄒𐄓𐄔𐄕𐄖𐄗𐄘𐄙𐄚𐄛𐄜𐄝𐄞𐄟𐄠𐄡𐄢𐄣𐄤𐄥𐄦𐄧𐄨𐄩𐄪𐄫𐄬𐄭𐄮𐄯𐄰𐄱𐄲𐄳𐄴𐄵𐄶𐄷𐄸𐄹𐄺𐄻𐄼𐄽𐄾𐄿𐅀𐅁𐅂𐅃𐅄𐅅𐅆𐅇𐅈𐅉𐅊𐅋𐅌𐅍𐅎𐅏𐅐𐅑𐅒𐅓𐅔𐅕𐅖𐅗𐅘𐅙𐅚𐅛𐅜𐅝𐅞𐅟𐅠𐅡𐅢𐅣𐅤𐅥𐅦𐅧𐅨𐅩𐅪𐅫𐅬𐅭𐅮𐅯𐅰𐅱𐅲𐅳𐅴𐅵𐅶𐅷𐅸𐅹𐅺𐅻𐅼𐅽𐅾𐅿𐆀𐆁𐆂𐆃𐆄𐆅𐆆𐆇𐆈𐆉𐆊𐆋𐆌𐆍𐆎𐆏𐆐𐆑𐆒𐆓𐆔𐆕𐆖𐆗𐆘𐆙𐆚𐆛𐆜𐆝𐆞𐆟𐆠𐆡𐆢𐆣𐆤𐆥𐆦𐆧𐆨𐆩𐆪𐆫𐆬𐆭𐆮𐆯𐆰𐆱𐆲𐆳𐆴𐆵𐆶𐆷𐆸𐆹𐆺𐆻𐆼𐆽𐆾𐆿𐇀𐇁𐇂𐇃𐇄𐇅𐇆𐇇𐇈𐇉𐇊𐇋𐇌𐇍𐇎𐇏𐇐𐇑𐇒𐇓𐇔𐇕𐇖𐇗𐇘𐇙𐇚𐇛𐇜𐇝𐇞𐇟𐇠𐇡𐇢𐇣𐇤𐇥𐇦𐇧𐇨𐇩𐇪𐇫𐇬𐇭𐇮𐇯𐇰𐇱𐇲𐇳𐇴𐇵𐇶𐇷𐇸𐇹𐇺𐇻𐇼𐇽𐇾𐇿𐈀𐈁𐈂𐈃𐈄𐈅𐈆𐈇𐈈𐈉𐈊𐈋𐈌𐈍𐈎𐈏𐈐𐈑𐈒𐈓𐈔𐈕𐈖𐈗𐈘𐈙𐈚𐈛𐈜𐈝𐈞𐈟𐈠𐈡𐈢𐈣𐈤𐈥𐈦𐈧𐈨𐈩𐈪𐈫𐈬𐈭𐈮𐈯𐈰𐈱𐈲𐈳𐈴𐈵𐈶𐈷𐈸𐈹𐈺𐈻𐈼𐈽𐈾𐈿𐉀𐉁𐉂𐉃𐉄𐉅𐉆𐉇𐉈𐉉𐉊𐉋𐉌𐉍𐉎𐉏𐉐𐉑𐉒𐉓𐉔𐉕𐉖𐉗𐉘𐉙𐉚𐉛𐉜𐉝𐉞𐉟𐉠𐉡𐉢𐉣𐉤𐉥𐉦𐉧𐉨𐉩𐉪𐉫𐉬𐉭𐉮𐉯𐉰𐉱𐉲𐉳𐉴𐉵𐉶𐉷𐉸𐉹𐉺𐉻𐉼𐉽𐉾𐉿𐊀𐊁𐊂𐊃𐊄𐊅𐊆𐊇𐊈𐊉𐊊𐊋𐊌𐊍𐊎𐊏𐊐𐊑𐊒𐊓𐊔𐊕𐊖𐊗𐊘𐊙𐊚𐊛𐊜𐊝𐊞𐊟𐊠𐊡𐊢𐊣𐊤𐊥𐊦𐊧𐊨𐊩𐊪𐊫𐊬𐊭𐊮𐊯𐊰𐊱𐊲𐊳𐊴𐊵𐊶𐊷𐊸𐊹𐊺𐊻𐊼𐊽𐊾𐊿𐋀𐋁𐋂𐋃𐋄𐋅𐋆𐋇𐋈𐋉𐋊𐋋𐋌𐋍𐋎𐋏𐋐𐋑𐋒𐋓𐋔𐋕𐋖𐋗𐋘𐋙𐋚𐋛𐋜𐋝𐋞𐋟𐋠𐋡𐋢𐋣𐋤𐋥𐋦𐋧𐋨𐋩𐋪𐋫𐋬𐋭𐋮𐋯𐋰𐋱𐋲𐋳𐋴𐋵𐋶𐋷𐋸𐋹𐋺𐋻𐋼𐋽𐋾𐋿𐌀𐌁𐌂𐌃𐌄𐌅𐌆𐌇𐌈𐌉𐌊𐌋𐌌𐌍𐌎𐌏𐌐𐌑𐌒𐌓𐌔𐌕𐌖𐌗𐌘𐌙𐌚𐌛𐌜𐌝𐌞𐌟𐌠𐌡𐌢𐌣𐌤𐌥𐌦𐌧𐌨𐌩𐌪𐌫𐌬𐌭𐌮𐌯𐌰𐌱𐌲𐌳𐌴𐌵𐌶𐌷𐌸𐌹𐌺𐌻𐌼𐌽𐌾𐌿𐍀𐍁𐍂𐍃𐍄𐍅𐍆𐍇𐍈𐍉𐍊𐍋𐍌𐍍𐍎𐍏𐍐𐍑𐍒𐍓𐍔𐍕𐍖𐍗𐍘𐍙𐍚𐍛𐍜𐍝𐍞𐍟𐍠𐍡𐍢𐍣𐍤𐍥𐍦𐍧𐍨𐍩𐍪𐍫𐍬𐍭𐍮𐍯𐍰𐍱𐍲𐍳𐍴𐍵𐍶𐍷𐍸𐍹𐍺𐍻𐍼𐍽𐍾𐍿𐎀𐎁𐎂𐎃𐎄𐎅𐎆𐎇𐎈𐎉𐎊𐎋𐎌𐎍𐎎𐎏𐎐𐎑𐎒𐎓𐎔𐎕𐎖𐎗𐎘𐎙𐎚𐎛𐎜𐎝𐎞𐎟𐎠𐎡𐎢𐎣𐎤𐎥𐎦𐎧𐎨𐎩𐎪𐎫𐎬𐎭𐎮𐎯𐎰𐎱𐎲𐎳𐎴𐎵𐎶𐎷𐎸𐎹𐎺𐎻𐎼𐎽𐎾𐎿𐏀𐏁𐏂𐏃𐏄𐏅𐏆𐏇𐏈𐏉𐏊𐏋𐏌𐏍𐏎𐏏𐏐𐏑𐏒𐏓𐏔𐏕𐏖𐏗𐏘𐏙𐏚𐏛𐏜𐏝𐏞𐏟𐏠𐏡𐏢𐏣𐏤𐏥𐏦𐏧𐏨𐏩𐏪𐏫𐏬𐏭𐏮𐏯𐏰𐏱𐏲𐏳𐏴𐏵𐏶𐏷𐏸𐏹𐏺𐏻𐏼𐏽𐏾𐏿𐐀𐐁𐐂𐐃𐐄𐐅𐐆𐐇𐐈𐐉𐐊𐐋𐐌𐐍𐐎𐐏𐐐𐐑𐐒𐐓𐐔𐐕𐐖𐐗𐐘𐐙𐐚𐐛𐐜𐐝𐐞𐐟𐐠𐐡𐐢𐐣𐐤𐐥𐐦𐐧𐐨𐐩𐐪𐐫𐐬𐐭𐐮𐐯𐐰𐐱𐐲𐐳𐐴𐐵𐐶𐐷𐐸𐐹𐐺𐐻𐐼𐐽𐐾𐐿𐑀𐑁𐑂𐑃𐑄𐑅𐑆𐑇𐑈𐑉𐑊𐑋𐑌𐑍𐑎𐑏𐑐𐑑𐑒𐑓𐑔𐑕𐑖𐑗𐑘𐑙𐑚𐑛𐑜𐑝𐑞𐑟𐑠𐑡𐑢𐑣𐑤𐑥𐑦𐑧𐑨𐑩𐑪𐑫𐑬𐑭𐑮𐑯𐑰𐑱𐑲𐑳𐑴𐑵𐑶𐑷𐑸𐑹𐑺𐑻𐑼𐑽𐑾𐑿𐒀𐒁𐒂𐒃𐒄𐒅𐒆𐒇𐒈𐒉𐒊𐒋𐒌𐒍𐒎𐒏𐒐𐒑𐒒𐒓𐒔𐒕𐒖𐒗𐒘𐒙𐒚𐒛𐒜𐒝𐒞𐒟𐒠𐒡𐒢𐒣𐒤𐒥𐒦𐒧𐒨𐒩𐒪𐒫𐒬𐒭𐒮𐒯𐒰𐒱𐒲𐒳𐒴𐒵𐒶𐒷𐒸𐒹𐒺𐒻𐒼𐒽𐒾𐒿𐓀𐓁𐓂𐓃𐓄𐓅𐓆𐓇𐓈𐓉𐓊𐓋𐓌𐓍𐓎𐓏𐓐𐓑𐓒𐓓𐓔𐓕𐓖𐓗𐓘𐓙𐓚𐓛𐓜𐓝𐓞𐓟𐓠𐓡𐓢𐓣𐓤𐓥𐓦𐓧𐓨𐓩𐓪𐓫𐓬𐓭𐓮𐓯𐓰𐓱𐓲𐓳𐓴𐓵𐓶𐓷𐓸𐓹𐓺𐓻𐓼𐓽𐓾𐓿𐔀𐔁𐔂𐔃𐔄𐔅𐔆𐔇𐔈𐔉𐔊𐔋𐔌𐔍𐔎𐔏𐔐𐔑𐔒𐔓𐔔𐔕𐔖𐔗𐔘𐔙𐔚𐔛𐔜𐔝𐔞𐔟𐔠𐔡𐔢𐔣𐔤𐔥𐔦𐔧𐔨𐔩𐔪𐔫𐔬𐔭𐔮𐔯𐔰𐔱𐔲𐔳𐔴𐔵𐔶𐔷𐔸𐔹𐔺𐔻𐔼𐔽𐔾𐔿𐕀𐕁𐕂𐕃𐕄𐕅𐕆𐕇𐕈𐕉𐕊𐕋𐕌𐕍𐕎𐕏𐕐𐕑𐕒𐕓𐕔𐕕𐕖𐕗𐕘𐕙𐕚𐕛𐕜𐕝𐕞𐕟𐕠𐕡𐕢𐕣𐕤𐕥𐕦𐕧𐕨𐕩𐕪𐕫𐕬𐕭𐕮𐕯𐕰𐕱𐕲𐕳𐕴𐕵𐕶𐕷𐕸𐕹𐕺𐕻𐕼𐕽𐕾𐕿𐖀𐖁𐖂𐖃𐖄𐖅𐖆𐖇𐖈𐖉𐖊𐖋𐖌𐖍𐖎𐖏𐖐𐖑𐖒𐖓𐖔𐖕𐖖𐖗𐖘𐖙𐖚𐖛𐖜𐖝𐖞𐖟𐖠𐖡𐖢𐖣𐖤𐖥𐖦𐖧𐖨𐖩𐖪𐖫𐖬𐖭𐖮𐖯𐖰𐖱𐖲𐖳𐖴𐖵𐖶𐖷𐖸𐖹𐖺𐖻𐖼𐖽𐖾𐖿𐗀𐗁𐗂𐗃𐗄𐗅𐗆𐗇𐗈𐗉𐗊𐗋𐗌𐗍𐗎𐗏𐗐𐗑𐗒𐗓𐗔𐗕𐗖𐗗𐗘𐗙𐗚𐗛𐗜𐗝𐗞𐗟𐗠𐗡𐗢𐗣𐗤𐗥𐗦𐗧𐗨𐗩𐗪𐗫𐗬𐗭𐗮𐗯𐗰𐗱𐗲𐗳𐗴𐗵𐗶𐗷𐗸𐗹𐗺𐗻𐗼𐗽𐗾𐗿𐘀𐘁𐘂𐘃𐘄𐘅𐘆𐘇𐘈𐘉𐘊𐘋𐘌𐘍𐘎𐘏𐘐𐘑𐘒𐘓𐘔𐘕𐘖𐘗𐘘𐘙𐘚𐘛𐘜𐘝𐘞𐘟𐘠𐘡𐘢𐘣𐘤𐘥𐘦𐘧𐘨𐘩𐘪𐘫𐘬𐘭𐘮𐘯𐘰𐘱𐘲𐘳𐘴𐘵𐘶𐘷𐘸𐘹𐘺𐘻𐘼𐘽𐘾𐘿𐙀𐙁𐙂𐙃𐙄𐙅𐙆𐙇𐙈𐙉𐙊𐙋𐙌𐙍𐙎𐙏𐙐𐙑𐙒𐙓𐙔𐙕𐙖𐙗𐙘𐙙𐙚𐙛𐙜𐙝𐙞𐙟𐙠𐙡𐙢𐙣𐙤𐙥𐙦𐙧𐙨𐙩𐙪𐙫𐙬𐙭𐙮𐙯𐙰𐙱𐙲𐙳𐙴𐙵𐙶𐙷𐙸𐙹𐙺𐙻𐙼𐙽𐙾𐙿𐚀𐚁𐚂𐚃𐚄𐚅𐚆𐚇𐚈𐚉𐚊𐚋𐚌𐚍𐚎𐚏𐚐𐚑𐚒𐚓𐚔𐚕𐚖𐚗𐚘𐚙𐚚𐚛𐚜𐚝𐚞𐚟𐚠𐚡𐚢𐚣𐚤𐚥𐚦𐚧𐚨𐚩𐚪𐚫𐚬𐚭𐚮𐚯𐚰𐚱𐚲𐚳𐚴𐚵𐚶𐚷𐚸𐚹𐚺𐚻𐚼𐚽𐚾𐚿𐛀𐛁𐛂𐛃𐛄𐛅𐛆𐛇𐛈𐛉𐛊𐛋𐛌𐛍𐛎𐛏𐛐𐛑𐛒𐛓𐛔𐛕𐛖𐛗𐛘𐛙𐛚𐛛𐛜𐛝𐛞𐛟𐛠𐛡𐛢𐛣𐛤𐛥𐛦𐛧𐛨𐛩𐛪𐛫𐛬𐛭𐛮𐛯𐛰𐛱𐛲𐛳𐛴𐛵𐛶𐛷𐛸𐛹𐛺𐛻𐛼𐛽𐛾𐛿𐜀𐜁𐜂𐜃𐜄𐜅𐜆𐜇𐜈𐜉𐜊𐜋𐜌𐜍𐜎𐜏𐜐𐜑𐜒𐜓𐜔𐜕𐜖𐜗𐜘𐜙𐜚𐜛𐜜𐜝𐜞𐜟𐜠𐜡𐜢𐜣𐜤𐜥𐜦𐜧𐜨𐜩𐜪𐜫𐜬𐜭𐜮𐜯𐜰𐜱𐜲𐜳𐜴𐜵𐜶𐜷𐜸𐜹𐜺𐜻𐜼𐜽𐜾𐜿𐝀𐝁𐝂𐝃𐝄𐝅𐝆𐝇𐝈𐝉𐝊𐝋𐝌𐝍𐝎𐝏𐝐𐝑𐝒𐝓𐝔𐝕𐝖𐝗𐝘𐝙𐝚𐝛𐝜𐝝𐝞𐝟𐝠𐝡𐝢𐝣𐝤𐝥𐝦𐝧𐝨𐝩𐝪𐝫𐝬𐝭𐝮𐝯𐝰𐝱𐝲𐝳𐝴𐝵𐝶𐝷𐝸𐝹𐝺𐝻𐝼𐝽𐝾𐝿𐞀𐞁𐞂𐞃𐞄𐞅𐞆𐞇𐞈𐞉𐞊𐞋𐞌𐞍𐞎𐞏𐞐𐞑𐞒𐞓𐞔𐞕𐞖𐞗𐞘𐞙𐞚𐞛𐞜𐞝𐞞𐞟𐞠𐞡𐞢𐞣𐞤𐞥𐞦𐞧𐞨𐞩𐞪𐞫𐞬𐞭𐞮𐞯𐞰𐞱𐞲𐞳𐞴𐞵𐞶𐞷𐞸𐞹𐞺𐞻𐞼𐞽𐞾𐞿𐟀𐟁𐟂𐟃𐟄𐟅𐟆𐟇𐟈𐟉𐟊𐟋𐟌𐟍𐟎𐟏𐟐𐟑𐟒𐟓𐟔𐟕𐟖𐟗𐟘𐟙𐟚𐟛𐟜𐟝𐟞𐟟𐟠𐟡𐟢𐟣𐟤𐟥𐟦𐟧𐟨𐟩𐟪𐟫𐟬𐟭𐟮𐟯𐟰𐟱𐟲𐟳𐟴𐟵𐟶𐟷𐟸𐟹𐟺𐟻𐟼𐟽𐟾𐟿𐠀𐠁𐠂𐠃𐠄𐠅𐠆𐠇𐠈𐠉𐠊𐠋𐠌𐠍𐠎𐠏𐠐𐠑𐠒𐠓𐠔𐠕𐠖𐠗𐠘𐠙𐠚𐠛𐠜𐠝𐠞𐠟𐠠𐠡𐠢𐠣𐠤𐠥𐠦𐠧𐠨𐠩𐠪𐠫𐠬𐠭𐠮𐠯𐠰𐠱𐠲𐠳𐠴𐠵𐠶𐠷𐠸𐠹𐠺𐠻𐠼𐠽𐠾𐠿𐡀𐡁𐡂𐡃𐡄𐡅𐡆𐡇𐡈𐡉𐡊𐡋𐡌𐡍𐡎𐡏𐡐𐡑𐡒𐡓𐡔𐡕𐡖𐡗𐡘𐡙𐡚𐡛𐡜𐡝𐡞𐡟𐡠𐡡𐡢𐡣𐡤𐡥𐡦𐡧𐡨𐡩𐡪𐡫𐡬𐡭𐡮𐡯𐡰𐡱𐡲𐡳𐡴𐡵𐡶𐡷𐡸𐡹𐡺𐡻𐡼𐡽𐡾𐡿𐢀𐢁𐢂𐢃𐢄𐢅𐢆𐢇𐢈𐢉𐢊𐢋𐢌𐢍𐢎𐢏𐢐𐢑𐢒𐢓𐢔𐢕𐢖𐢗𐢘𐢙𐢚𐢛𐢜𐢝𐢞𐢟𐢠𐢡𐢢𐢣𐢤𐢥𐢦𐢧𐢨𐢩𐢪𐢫𐢬𐢭𐢮𐢯𐢰𐢱𐢲𐢳𐢴𐢵𐢶𐢷𐢸𐢹𐢺𐢻𐢼𐢽𐢾𐢿𐣀𐣁𐣂𐣃𐣄𐣅𐣆𐣇𐣈𐣉𐣊𐣋𐣌𐣍𐣎𐣏𐣐𐣑𐣒𐣓𐣔𐣕𐣖𐣗𐣘𐣙𐣚𐣛𐣜𐣝𐣞𐣟𐣠𐣡𐣢𐣣𐣤𐣥𐣦𐣧𐣨𐣩𐣪𐣫𐣬𐣭𐣮𐣯𐣰𐣱𐣲𐣳𐣴𐣵𐣶𐣷𐣸𐣹𐣺𐣻𐣼𐣽𐣾𐣿𐤀𐤁𐤂𐤃𐤄𐤅𐤆𐤇𐤈𐤉𐤊𐤋𐤌𐤍𐤎𐤏𐤐𐤑𐤒𐤓𐤔𐤕𐤖𐤗𐤘𐤙𐤚𐤛𐤜𐤝𐤞𐤟𐤠𐤡𐤢𐤣𐤤𐤥𐤦𐤧𐤨𐤩𐤪𐤫𐤬𐤭𐤮𐤯𐤰𐤱𐤲𐤳𐤴𐤵𐤶𐤷𐤸𐤹𐤺𐤻𐤼𐤽𐤾𐤿𐥀𐥁𐥂𐥃𐥄𐥅𐥆𐥇𐥈𐥉𐥊𐥋𐥌𐥍𐥎𐥏𐥐𐥑𐥒𐥓𐥔𐥕𐥖𐥗𐥘𐥙𐥚𐥛𐥜𐥝𐥞𐥟𐥠𐥡𐥢𐥣𐥤𐥥𐥦𐥧𐥨𐥩𐥪𐥫𐥬𐥭𐥮𐥯𐥰𐥱𐥲𐥳𐥴𐥵𐥶𐥷𐥸𐥹𐥺𐥻𐥼𐥽𐥾𐥿𐦀𐦁𐦂𐦃𐦄𐦅𐦆𐦇𐦈𐦉𐦊𐦋𐦌𐦍𐦎𐦏𐦐𐦑𐦒𐦓𐦔𐦕𐦖𐦗𐦘𐦙𐦚𐦛𐦜𐦝𐦞𐦟𐦠𐦡𐦢𐦣𐦤𐦥𐦦𐦧𐦨𐦩𐦪𐦫𐦬𐦭𐦮𐦯𐦰𐦱𐦲𐦳𐦴𐦵𐦶𐦷𐦸𐦹𐦺𐦻𐦼𐦽𐦾𐦿𐧀𐧁𐧂𐧃𐧄𐧅𐧆𐧇𐧈𐧉𐧊𐧋𐧌𐧍𐧎𐧏𐧐𐧑𐧒𐧓𐧔𐧕𐧖𐧗𐧘𐧙𐧚𐧛𐧜𐧝𐧞𐧟𐧠𐧡𐧢𐧣𐧤𐧥𐧦𐧧𐧨𐧩𐧪𐧫𐧬𐧭𐧮𐧯𐧰𐧱𐧲𐧳𐧴𐧵𐧶𐧷𐧸𐧹𐧺𐧻𐧼𐧽𐧾𐧿𐨀𐨁𐨂𐨃𐨄𐨅𐨆𐨇𐨈𐨉𐨊𐨋𐨌𐨍𐨎𐨏𐨐𐨑𐨒𐨓𐨔𐨕𐨖𐨗𐨘𐨙𐨚𐨛𐨜𐨝𐨞𐨟𐨠𐨡𐨢𐨣𐨤𐨥𐨦𐨧𐨨𐨩𐨪𐨫𐨬𐨭𐨮𐨯𐨰𐨱𐨲𐨳𐨴𐨵𐨶𐨷𐨹𐨺𐨸𐨻𐨼𐨽𐨾𐨿𐩀𐩁𐩂𐩃𐩄𐩅𐩆𐩇𐩈𐩉𐩊𐩋𐩌𐩍𐩎𐩏𐩐𐩑𐩒𐩓𐩔𐩕𐩖𐩗𐩘𐩙𐩚𐩛𐩜𐩝𐩞𐩟𐩠𐩡𐩢𐩣𐩤𐩥𐩦𐩧𐩨𐩩𐩪𐩫𐩬𐩭𐩮𐩯𐩰𐩱𐩲𐩳𐩴𐩵𐩶𐩷𐩸𐩹𐩺𐩻𐩼𐩽𐩾𐩿𐪀𐪁𐪂𐪃𐪄𐪅𐪆𐪇𐪈𐪉𐪊𐪋𐪌𐪍𐪎𐪏𐪐𐪑𐪒𐪓𐪔𐪕𐪖𐪗𐪘𐪙𐪚𐪛𐪜𐪝𐪞𐪟𐪠𐪡𐪢𐪣𐪤𐪥𐪦𐪧𐪨𐪩𐪪𐪫𐪬𐪭𐪮𐪯𐪰𐪱𐪲𐪳𐪴𐪵𐪶𐪷𐪸𐪹𐪺𐪻𐪼𐪽𐪾𐪿𐫀𐫁𐫂𐫃𐫄𐫅𐫆𐫇𐫈𐫉𐫊𐫋𐫌𐫍𐫎𐫏𐫐𐫑𐫒𐫓𐫔𐫕𐫖𐫗𐫘𐫙𐫚𐫛𐫜𐫝𐫞𐫟𐫠𐫡𐫢𐫣𐫤𐫦𐫥𐫧𐫨𐫩𐫪𐫫𐫬𐫭𐫮𐫯𐫰𐫱𐫲𐫳𐫴𐫵𐫶𐫷𐫸𐫹𐫺𐫻𐫼𐫽𐫾𐫿𐬀𐬁𐬂𐬃𐬄𐬅𐬆𐬇𐬈𐬉𐬊𐬋𐬌𐬍𐬎𐬏𐬐𐬑𐬒𐬓𐬔𐬕𐬖𐬗𐬘𐬙𐬚𐬛𐬜𐬝𐬞𐬟𐬠𐬡𐬢𐬣𐬤𐬥𐬦𐬧𐬨𐬩𐬪𐬫𐬬𐬭𐬮𐬯𐬰𐬱𐬲𐬳𐬴𐬵𐬶𐬷𐬸𐬹𐬺𐬻𐬼𐬽𐬾𐬿𐭀𐭁𐭂𐭃𐭄𐭅𐭆𐭇𐭈𐭉𐭊𐭋𐭌𐭍𐭎𐭏𐭐𐭑𐭒𐭓𐭔𐭕𐭖𐭗𐭘𐭙𐭚𐭛𐭜𐭝𐭞𐭟𐭠𐭡𐭢𐭣𐭤𐭥𐭦𐭧𐭨𐭩𐭪𐭫𐭬𐭭𐭮𐭯𐭰𐭱𐭲𐭳𐭴𐭵𐭶𐭷𐭸𐭹𐭺𐭻𐭼𐭽𐭾𐭿𐮀𐮁𐮂𐮃𐮄𐮅𐮆𐮇𐮈𐮉𐮊𐮋𐮌𐮍𐮎𐮏𐮐𐮑𐮒𐮓𐮔𐮕𐮖𐮗𐮘𐮙𐮚𐮛𐮜𐮝𐮞𐮟𐮠𐮡𐮢𐮣𐮤𐮥𐮦𐮧𐮨𐮩𐮪𐮫𐮬𐮭𐮮𐮯𐮰𐮱𐮲𐮳𐮴𐮵𐮶𐮷𐮸𐮹𐮺𐮻𐮼𐮽𐮾𐮿𐯀𐯁𐯂𐯃𐯄𐯅𐯆𐯇𐯈𐯉𐯊𐯋𐯌𐯍𐯎𐯏𐯐𐯑𐯒𐯓𐯔𐯕𐯖𐯗𐯘𐯙𐯚𐯛𐯜𐯝𐯞𐯟𐯠𐯡𐯢𐯣𐯤𐯥𐯦𐯧𐯨𐯩𐯪𐯫𐯬𐯭𐯮𐯯𐯰𐯱𐯲𐯳𐯴𐯵𐯶𐯷𐯸𐯹𐯺𐯻𐯼𐯽𐯾𐯿𐰀𐰁𐰂𐰃𐰄𐰅𐰆𐰇𐰈𐰉𐰊𐰋𐰌𐰍𐰎𐰏𐰐

ΤΟΤΗΣΕΥΣΕΒΕΙΑΣ
ΜΥΣΤΗΡΙΟΝ: ΟΣΕ

4th cent. A. D. Cod. Sinaiticus, 1 Tim. iii. 16.

το της ενσέβειας | μυστηριον^{ος} ε

ΚΑΛΥΜΜΑ ΕΠΙ ΤΗΝ ΚΑΡ'
ΔΙΑΝΑΥΤΩΝ ΚΕΙΤΑΙ

4th cent. A. D. Cod. Vaticanus, 2 Cor. iii. 15.

καλυμμα επι την καρ | διαν αυτων κειται' ηνι

ΚΑ : ΙΔΩΝ ΔΕ ΤΟ ΥΓΟΧΛΟΥΣ· ΑΝΕΒΗ ΕΙΣ ΤΟ ΟΡΟΣ

6th cent. Cod. Bezae, Mat. v. 1. Greek text.
ιδων δε τουσ υχλουσ' ανεβη εις το ορος

uidens autem turbas ascendit in montem

6th cent. Cod. Bezae, Mat. v. 1. Latin text.
videns autem turbas ascendit in montem

ΡΛΘ ΤΟΥΛΟΓΟΥ

6th cent. Cod. Purpureus, John xv. 20.
τον λογον ου

Locutus est autem d's
quia erit semen eius accola

6th cent. Cod. Amiatinus, Acts vii. 6.
Locutus est autem d[e]us | quia erit semen eius accola

ΩΝ ΤΗΝ ΕΣΤΙΝ ΤΟΝ
ΚΑΙ ΟΜΟΛΟΓΟΥΜΕΝΩΣ ΜΕΓΑ ΕΣΤΙΝ ΤΟ
ΕΑΝ ΤΟΝ ΕΣΤΙΝ ΤΟΝ ΕΑΝ ΤΟΝ ΕΣΤΙΝ ΤΟΝ

5th cent. Cod. Ephraemi, 1 Tim. iii. 15-16.

ωια της αλθειας | Και ομολογουμενωσ μεγα εστιν το στηριον | θ[εο]σ εφανερωθη εν σαρκι εδικαιωθη εν πνευματι

ΕΝΑΡΧΗ Η ΝΟΛΟΓΟΣ ΚΑΙ ΟΛΟΓΟΣ
ΤΙΡΟΣ ΤΩΝ ΘΗ' ΚΑΙ ΘΣΗΝΟΛΟΓΟΣ.

5th cent. Cod. Alexandrinus, John i. 1.

Εν αρχη ην ο λογοσ και ο λογοσ η | προσ τον θ[εο]ν' και θ[εο]σ ην ο λογοσ.

Προσέρχονται αὐτῷ φαρισαῖοι καὶ γραμματεῖς
ἀπὸ ἱεροσολύμων λέγοντες· διατί οἱ μαθη

10th cent. Cod. Basilensis, Mat. xv. 1.

Προσέρχονται αὐτῷ φαρισαῖοι καὶ γραμματεῖς
ἀπὸ ἱεροσολύμων λέγοντες· διατί οἱ μαθη

παρακλήσεως· ὁ παρακαλῶν | ἡμᾶς ἐπὶ
ἡμᾶς ἐν ἰσχύϊ τοῦ θ[εο]υ· τὸ εἶπε· ἡσυχία

10th cent. Cod. Euber, 2 Cor. i. 8, 4.

παρακλήσεωσ' ὁ παρακαλων | ἡμᾶς ἐπὶ
πᾶσῃ τῇ θλίψει· εἰς τὸ

ΟΙ ΔΕ ΟΤΙ ΑΝΤΙ
ΤΗΣ ΕΥΣΕΒΕΙΑΣ
ΕΑΝ ΤΟΝ ΕΣΤΙΝ ΤΟΝ ΕΑΝ ΤΟΝ ΕΣΤΙΝ ΤΟΝ

to 14 letters each. The characters are well executed uncials, unconnected with each other, without spaces between the words, with no large initial letters, no breathings nor accents, and with few marks of punctuation. The first line of each of the psalms and of the other poetical books is in red ink. It contains both the Old and the New Testament, the latter perfect. The *Codex Vaticanus*, a manuscript of the Greek Bible, deficient in some parts of the New Testament, is also ascribed to about the middle of the 4th century, although Tischendorf considers the evidence not quite so conclusive as in the case of the *Sinaiticus*. Its early history is not known, but it appears in the first catalogue of the Vatican library in 1475. It is a quarto volume, 10½ inches high, 10 broad, and 4½ thick, and is bound in red morocco; contains 146 leaves of fine thin vellum, has three columns of 42 lines each to the page, and is written in elegant uncials, somewhat smaller than those of the *Sinaiticus*, with no spaces between the words. As originally written, it had no large capital letters and no breathings nor accents; but capital letters in blue or red, three fourths of an inch high, have been added at the beginning of each book by a later corrector, who also put in the breathings and accents, and probably the stops. Of the Biblical manuscripts of the 5th century, the *Codex Alexandrinus* of the British museum, containing nearly the whole of the Greek Bible, is the most important. It is in four quarto volumes, with pages 13 inches high by 10 broad, has two columns of 50 lines each to the page, and is written in uniform uncials, with the first three or four lines of each book in red letters. It differs from the *Sinaiticus* and the *Vaticanus* in having large initial letters. Scholars are generally agreed in ascribing it to the middle of the 5th century. (See ALEXANDRIAN CODEX.) Of the same century is the Ephraem palimpsest of the national library in Paris. It is about the size of the *Codex Alexandrinus*, though not quite so high, and has 209 leaves, of which 64 contain fragments of the Septuagint and 145 various parts of the New Testament. The original text, which was partly erased in the 12th century to make room for the writings of Ephraem Syrus, is in elegant uncials, without division of words or chapters, and with but one column to the page, consisting of from 40 to 46 lines. The *Codex Beza* or *Cantabrigiensis*, in the library of the university of Cambridge, belongs to the 6th century. It is a Greek manuscript, with a Latin translation on the opposite pages, of the four Gospels and Acts, with a number of pages missing. It is a quarto volume of 414 leaves, with pages 10 inches high by 8 wide, and written stichometrically in a single column of 33 lines to the page. The first three lines of each book are in red ink. The characters are uncials, and the words are undivided. (See BEZA'S CODEX.) Among the fragments of manuscripts of this century, one of the most interesting is the *Codex*

Purpureus, four leaves of which are in the British museum, six in the Vatican, and two in the imperial library at Vienna. Tischendorf found 33 additional leaves in the island of Patmos. It is written in silver letters, now quite black from age (the names of God and Christ in gold), on very thin purple vellum, and has two columns of 16 lines each to the page. The characters are large Greek uncials, written without division of words. Among the oldest and most important of the cursive Greek manuscripts of the New Testament is the *Codex Basilensis*, in the library of Basel, ascribed to the 10th century. It has one column of 38 lines to each page, and is written in small elegant characters, with breathings, accents, iota subscripts, and a few illuminations, among which are portraits of the emperor Leo the Philosopher and his son Constantine Porphyrogenitus. The *Codex Ruber*, a cursive manuscript containing fragments of the New Testament, in the national library at Paris, is written entirely in red ink; it belongs to the 10th or 11th century. Of the manuscripts of the Latin Bible, the *Codex Amiatinus*, in the Laurentian library at Florence, is the most important. It derives its name from the Cistercian monastery of Monte Amiato, in Tuscany, where it was owned previous to its acquisition by the Laurentian library. From intrinsic evidence it is supposed to have been written about 541 by Servandus, abbot of the Benedictine monastery near Alatri, on the borders of Latium. It consists of 1,029 leaves, of which 796 are devoted to the Old Testament and 232 to the New. It is written in well formed Roman uncials, and has two columns to the page, each having in general 43 lines stichometrically arranged. The first line of each book is rubricated. Other renowned manuscripts of the same century are a Virgil in the Vatican, a Prudentius, the sermons of St. Augustine on papyrus, the psalter of St. Germain-des-Prés in silver letters, and a copy of the Theodosian code, all in the national library at Paris; the unique copy of the fifth decade of Livy, in the imperial library at Vienna; a Lactantius and the breviary of Alaric at Bologna; and a palimpsest containing 4,000 lines of the Iliad in the British museum. The celebrated manuscript of the Digest of Justinian too, in the Laurentian library at Florence, belongs probably to the close of the 6th century. —The science of reading and judging ancient manuscripts is called diplomatics, and is a branch of palæography. In examining a manuscript in order to judge of its antiquity, it is necessary to consider the quality and character of the material on which it is written; the style of the writing; the inks used; its miniatures, vignettes, and arabesques, and the colors with which they are executed; the cover, its material and ornamentation; and the character of the contents. The oldest Greek and Latin manuscripts are written in square capital letters, without division of words or

sentences, and without punctuation. This style was in use until about the 6th century, when it was superseded by uncial writing, which had coexisted with it from the 3d century. A kind of capitals called rustics, having the letters slightly inclined, were used however until a much later time. Uncials differ from pure capitals in having some of the letters, particularly A, D, E, and M, curved. The most of the extant Greek and Latin manuscripts written between the 4th and 6th centuries are in uncial characters; but from the 6th to the close of the 8th century semi-uncial writing, a mixture of small and capital letters, came gradually into use, and led eventually to the small cursive or minuscule writing of the 10th century. These remarks apply more particularly to book manuscripts, for Greek cursives were used in letters and documents before the Christian era. Latin cursives were introduced into book manuscripts as early as the 4th century. In the oldest manuscripts the characters are written separately each from another, and there are no divisions into words or sentences, nor distinction of initial letters. Abbreviations early came into use. At first they were limited to principal words, such as names of the Deity; but in time, particularly in the 12th and 13th centuries, they became so common as to render many manuscripts almost unintelligible. Many of these abbreviations are arbitrary signs derived from the so-called *Notæ Tironianæ*, or Roman system of shorthand, ascribed by some to the invention of Tiro, the freedman of Cicero. A line is generally drawn above each abbreviated word to denote contraction. When the period or dot came into use, it was placed generally above, not in the line; the comma was introduced about the close of the 10th century, and marks of interrogation and exclamation and parentheses about the 15th century. The repetition at the foot of each page of the first word of the following page belongs to the 12th and subsequent centuries. The Arabic numerals first appear in writing near the beginning of the 12th century.—The most important works on manuscripts and palæography are: Mabilon, *De Re Diplomatica* (Paris, 1681); Montfaucon, *Palæographia Græca* (Paris, 1708), and *Bibliotheca Bibliothecarum Manuscriptorum Nova* (2 vols., 1739); Maffei, *Istoria diplomatica*, &c. (Mantua, 1727); Baring, *Clavis Diplomatica* (Hanover, 1737-'54); Toussaint and Tassin, *Nouveau traité de diplomatique, par deux religieux bénédictins*, &c. (6 vols. 4to, Paris, 1750-'65); Vaines, *Dictionnaire raisonné de diplomatique* (2 vols. 8vo, Paris, 1773-'4); Astle, "Origin and Progress of Writing" (London, 1784); Kopp, *Palæographica Critica* (4 vols., Mannheim, 1817-'29); Ebert, *Zur Handschriftenkunde* (2 vols., Leipsic, 1825-'7); Wailly, *Éléments de paléographie* (2 vols. 4to, Paris, 1838); Silvestre, *Paléographie universelle*, facsimiles, with descriptions by Champollion-Figeac and Aimé Champollion (4 vols.

fol., Paris, 1839-'45); Marini, *Diplomatica pontificia* (Rome, 1841); Westwood, *Palæographia Sacra Pictoria* (London, 1845); Chassant, *Dictionnaire des abréviations latines et françaises usitées dans les manuscrits . . . du moyen âge* (Evreux, 1844; 3d ed., Paris, 1866); and Wattenbach, *Anleitung zur griechischen Paläographie* (Leipsic, 1867).

MANUTIUS (MANUZIO). I. **Aldus**, called the Elder, the first of a well known family of Italian printers, born at Bassiano about 1449, died in Venice, Feb. 3, 1515. He was deeply versed in classical literature, and about 1490 established a printing press in Venice, which soon became celebrated for the variety and excellence of the works issuing from it. In 1494 appeared his edition in Latin and Greek of the "Hero and Leander" of Musæus, followed within a few years by editions of Plato, Aristotle, Herodotus, Pindar, the Greek dramatists, &c., many of which were printed from original manuscripts procured from distant countries at considerable expense. His Latin editions, published subsequent to 1500, and commencing with Virgil, are printed in a character cast, it is said, in imitation of the handwriting of Petrarch, and now called *Italic*; and the editorial labors of the publisher were shared by a society of learned men who met at his house and formed what was called the Aldine academy. These impressions are said to be more correctly printed than the Greek. He suffered by the wars in which Venice was engaged in the beginning of the 16th century, but subsequently pursued his avocation with industry and success until his death. Besides the numerous prefaces and dissertations in Greek and Latin embodied in his publications, he produced grammars of the Greek and Latin languages, a Greek-Latin dictionary, translations, &c. The title pages of his books have a device representing a dolphin coiled about the shank of an anchor, on the sides of which are the syllables *Al* and *Dvs*. II. **Paulus**, youngest son of the preceding, born in Venice, in 1511 or 1512, died in Rome, April 6, 1574. He was a man of equal learning and critical ability with his father, and was distinguished by the correctness of his editions of the Latin classics, particularly of his Cicero, with prefaces, notes, and an index. Failing to receive adequate patronage in Venice, he repaired about 1562 to Rome, and was for some time employed in editing and printing the manuscripts of the church fathers deposited in the capitol. He returned to Venice in 1570, but again went to Rome, and died in poverty. He published a Latin translation of the Philippics of Demosthenes, and a number of original works in Latin and Italian, which entitle him to rank among the most polished writers of the 16th century. III. **Aldus**, called the Younger, son of the preceding, born in Venice, Feb. 13, 1547, died in Rome, Oct. 28, 1597. He published at the age of 11 a collection of choice specimens from Latin and Italian authors, and three years later

produced a treatise on Latin orthography, *Orthographiæ Ratio*, founded on inscriptions, medals, and manuscripts. Notwithstanding these evidences of precocity, his mental capacity and attainments were inferior to those of his father or grandfather; and in consequence of his neglect to employ competent persons, his publications are the least valuable of all emanating from the Aldine press. He resigned his press in 1584 to one of his workmen, and during the remainder of his life was professor of belles-lettres successively in Bologna, Pisa, and Rome. He published works in Latin and Italian, besides commentaries on Horace, Cicero, &c. (See *ALDINE EDITIONS*.)

MANZONI, Alessandro, count, an Italian novelist, born in Milan, March 8, 1784, died there, May 22, 1873. His father possessed little cultivation; his mother was a daughter of the distinguished philosophical economist Beccaria. He studied first at Milan and afterward at Pavia, where he was an enthusiast for Alfieri, Monti, and Foscolo. In 1805 he went with his mother to Paris. The sudden death of a friend furnished the subject of his first poem, in blank verse, entitled *In morte di Carlo Imbonati* (Paris, 1806). Returning to Milan in 1807, he married in the following year the daughter of a banker of Geneva, and published in 1809 his mythological poem *Urania*. His education and residence in Paris had led him to imbibe skeptical opinions, and his wife belonged to the Calvinistic church; but both now became devout Roman Catholics. The change was announced by his *Inni sacri* (Milan, 1810), a collection of religious lyrics. In 1820 appeared his romantic tragedy *Il conte di Carmagnola*, dedicated to Fauriel, which violated the unities of time and place, but was remarkable for its simplicity of plot and purity of style. It attracted attention throughout Europe, was severely criticised, was admired by Goethe, and was defended by the author in a letter written in French *Sur l'unité de temps et de lieu*. It was followed in 1823 by another tragedy, *Adelchi*; and on occasion of the death of Napoleon, he published an ode, *Il cinque Maggio* (1821), one of the finest modern Italian lyrics, in which he highly extolled the emperor. His greatest success was achieved by the novel *I promessi sposi* (3 vols., 1827), a Milanese story of the 17th century, which was translated into the principal languages of Europe, and was republished in America under the title of "The Betrothed Lovers." In an illustrated edition (1842), he added to the original text a *Storia della colonna infame*, in which he gives an account of the executions caused by the popular superstition during the plague of 1630, and touches upon some of the highest questions of social economy. In 1834 he wrote *Osservazioni sulla morale cattolica* (Florence), in reply to Sismondi's depreciation of the moral influence of the Catholic church in the middle ages; it was translated into English (London, 1836). He married a second time in 1833, and

was afflicted by the death of all his children (including a daughter married to Massimo d'Azeglio), the last dying a few weeks before him. In February, 1860, he was named senator of Italy. His 80th birthday was celebrated with much enthusiasm by his countrymen in 1864. In 1868, with R. Bonghi, he prepared a report on the means of establishing the unity of the Italian language on the basis of the Florentine dialect. Almost to the day of his death he was engaged in the preparation of a "History of the French Revolution." At his funeral the highest honors were paid to his memory, and the royal princes were among his pallbearers. The chapter of the Prussian order *pour le mérite* which had been conferred upon Manzoni was in 1874 given to Carlyle.

MAORI. See *NEW ZEALAND*.

MAP (Lat. *mappa*), a representation of a portion of the earth's surface, or of the celestial sphere, upon a plane. Its object is to present to the eye the bearings of objects upon the surface from each other, and their relative distances apart, as nearly correct as may be. But this can be done with accuracy only upon a globe, the surface of which is similar to that of the earth itself. Various plans, however, have been devised by which in the more convenient form of plane sheets true delineations of the surface are presented, reference being had to the principles upon which these maps are constructed. By the method called projection, the rules of perspective are applied to the delineation of objects upon the surface according to four principal modes. In the method of projection called orthographic, the eye is supposed to be at an infinite distance from the sphere, so that the rays of light coming from every point of the hemisphere opposite to it may be considered as parallel to one another. The sphere is intersected through its centre by a plane perpendicular to these rays, and it is upon this plane that the objects are projected, as their shadows might be cast upon it from the sun through a transparent medium. Objects near the centre of the plane would by this method be delineated in nearly correct proportions; but in receding from this, as the rays strike more obliquely upon the surface of the sphere, their projection becomes more and more distorted, and the parallels of latitude or meridians of longitude (as the eye is placed opposite the pole or the equator) are drawn more and more closely together.—In the stereographic projection, the eye is supposed to be placed at the surface of the sphere, and the surface to be delineated is the opposite hemisphere or a portion of it, of which the inner or concave side is presented to the eye. The plane upon which the objects are projected is supposed to be transparent, and placed so as to pass through the centre of the earth, its surface perpendicular to the line passing from the eye to the centre. In this method the meridians and parallels intersect each other as they do upon the globe; and though there is

distortion increasing from the centre, it is less than by some of the other methods. The stereographic method is much used for the maps of the world drawn in two hemispheres; and the meridian of 20° W. from Greenwich is usually selected for the plane of projection, because this throws the two great continental divisions of the earth into their respective hemispheres.—In the central or gnomonic projection, the eye is supposed to be at the centre of the earth, and the objects upon the surface are projected upon a plane which is a tangent to its surface. This method is obviously applicable to maps of a limited extent only; and except for maps of the polar regions, where the parallels of latitude are concentric circles, and the meridians are straight lines, they are troublesome to execute on account of the irregular curves the parallels assume.—In the globular projection, the eye is supposed to be at a distance from the sphere equal to the sine of 45° ; or, the diameter being 200, this distance is 70.7. In order, however, that the meridians may intersect the equator at equal distances, the distance for the eye is generally fixed at $59\frac{1}{2}$, the diameter being 200. Maps are also constructed in which the meridians are represented by arcs of circles cutting the equatorial diameter at equal distances, and the parallels by arcs of circles cutting the polar diameter at equal distances. These maps are not projections, and founded upon no geometrical principle which can be of service in their use; nevertheless they give a very good representation of the forms and relations of areas, and are of very simple construction. They are called globular maps, but must not be confounded with maps constructed upon the principle of globular projection, mentioned above.—Another method of map making is based upon the principle called development, which is a mode of projecting the forms upon the surface of the earth upon the inner surface of a cone or of a cylinder, which is supposed to envelop the earth and touch it only around the circle which is to be the middle latitude of the map. The points on the earth's surface being projected by other lines drawn through them from the centre, the inner surface of the cone or cylinder is afterward supposed to be unrolled or developed, and thus present the various objects upon a plane surface. Those situated nearest the middle latitude will be most correctly represented. In the use of the cylinder the latitude circles and meridians appear as parallel straight lines, and thus most correctly represent for nautical purposes the angles at which they are cut by objects moving over the surface on any other lines. This principle is in part the foundation of the projection known as Mercator's, and applied by him to charts for navigators, in which the correct bearings of objects upon the surface are of more importance to determine than the true figures of countries.—Still other principles are employed in constructing maps, according to

the special purposes for which they are designed. In maps of small areas, the figure of the earth may be neglected, and the positions and forms of bodies be represented as if the surface were itself a plane. Some have special objects in view, as the delineation of the coast lines, channels, shoals, reefs, lighthouses, &c., hence called hydrographic maps or charts; others are intended to show the political divisions of states, counties, and towns; and others, designated topographical maps, to represent the natural features of a country, as its mountains, hills, rivers, plains, &c., for all of which certain conventional signs are adopted. Maps have also been constructed to represent the courses of the winds and of oceanic currents over the surface of the earth; to designate the position of the isothermal lines; to indicate the geological formations found in different regions; and others to indicate the flora and the fauna of different countries. In the construction of geographical maps covering large areas, the principal places are located according to their latitudes and longitudes, and the lines of coasts and of countries, roads, &c., are plotted from the most exact surveys that have been made. Those which have been conducted under government patronage have furnished the materials for the best maps, and these are constantly improving as new materials are collected. Of the United States, the most complete maps are those of the state of Massachusetts made by order of the legislature, of the coast survey under the general government, Whitney's survey map of California, and Clarence King's survey map of the 42d parallel. The great lakes, more especially on the Canadian side, have been surveyed and mapped with great accuracy by Lieut. Bayfield of the royal army. Maps of the Spanish provinces in America have been made by the Spanish hydrographical depot in Madrid; and Brazil and other South American states have executed maps of their territories.—The ancient Egyptians had some knowledge of maps, as Sesostris caused the territories he possessed and had conquered to be represented upon tablets for the instruction of his people; and the Israelites appear to have acquired the same knowledge, from the record, in Josh. xviii. 6, of a map of the country being ordered by that lawgiver. The first map of the world, as known to the ancients, is said to have been made by Anaximander the Milesian. Herodotus makes mention of maps constructed by the Persians in the time of Darius, and of one by Aristagoras of Miletus. Eratosthenes introduced the lines of latitude and longitude, and the use of these was established by Hipparchus upon a mathematical principle. Still, for want of exact surveys, and owing to the dependence of geographers upon the reports of travellers and their *itineraria picta*, or painted itineraries, the maps afterward made were extremely inaccurate. Even those of Strabo and Ptolemy, of which those of the latter were for centuries the chief

authorities in geography, contained most extravagant errors, such as giving to the Mediterranean 1,400 miles greater length than belonged to it; and what is equally extraordinary, some of their gross exaggerations were continued in all the maps from that period down to the commencement of the 18th century. The system upon which Ptolemy's maps were drawn was that of stereographic projection. After the discovery of America, the early maps representing the position of the new world relative to the old were exceedingly inaccurate. In one published in Venice in 1546 Asia and America are joined together in lat. 38°. The great difficulty was in determining the true longitude of places; and until this could be done there was no means of avoiding such errors. In 1700 De Lisle published a new map of the world, and others of Europe, Asia, and Africa, founded on comparatively accurate astronomical observations, and in them the errors introduced from the maps of the ancients were first corrected. The true system of map making may be considered as at that time established.—Maps were first engraved on metal by Bücking and Schweyenheim in 1478, and on wood by Holl in 1482. An "Essay toward a Circumstantial History of Maps," by Hauber, was published in Ulm in 1724. A historical account of the art is also given in a series of lectures by J. G. Kohl, published in the report of the Smithsonian institution for 1856-'7. See also Santaran, *Essai sur la cartographie pendant le moyen âge* (3 vols., Paris, 1849-'52).

MAPES, or **Map**, **Walter**, an English Latin poet, born about the middle of the 12th century, probably in Herefordshire, died about 1210. He studied in Paris, and after his return became a great favorite on account of his learning and courtly manners, especially with Henry II., by whom he was sent on a mission to the French court, and to the council summoned by Pope Alexander III., at which he was called on to refute the deputies of the Waldenses. He received several livings, was made canon of the cathedrals of St. Paul and of Salisbury, precentor of Lincoln, incumbent of Westbury in Gloucestershire, and finally in 1196 archdeacon of Oxford. His tastes were however for elegant literature, and he is only known at the present day as a genial, festive, and satirical writer, to whom is attributed a great portion of the humorous rhyming Latin Leonine lyrics and Norman French romances of the latter half of the 12th century. Of late years it has been doubted whether Mapes was really the author of the poems which pass under his name, but the fact that they were for several centuries so generally attributed to him has been thought to prove that he excelled in a peculiar style of writing, and that a part of them at least are his. He also wrote much prose, both in Latin and Anglo-Norman. Among the former is his *De Nugis Curialium*, a work containing much curious information

of a very varied character; and among the latter are a large portion of the existing romances of the round table. The "Latin Poems commonly attributed to Walter Mapes" were printed in London by the Camden society in 1841, and *De Nugis Curialium* in 1850.

MAPIMI, a desert in N. Mexico, extending from the great bend of the Rio Grande, in lat. 30°, southward to the vicinity of Parras, in lat. 25° 30', and averaging 2½ degrees in width. It embraces two thirds of the state of Coahuila and parts of Chihuahua and Durango, and consists chiefly of a vast basin called the *Bolson*, or pocket, bounded N. by the Sierra del Carmen, E. by a portion of the Sierra Madre, and W. by low ranges of mountains. From the mountains to the northeast the rivers Escondido, Alamos, and Nadadores take their rise, but in the central basin there is no water except the brackish lagoons called Jaco, Agua Verde, Cayman, and El Muerto. Nomadic Apaches are the only inhabitants, but well preserved mummies have been found in caves near the S. border. There is rarely any vegetation. Meteoric iron and coal abound, and the precious metals are believed to exist. Only the S. portions, called the Cañon de San Marcos, and the plains of La Paila and La Bandurria, have been explored with any care. The Kickapoo Indians established themselves in 1864 near the N. border of this desert, and remained there till 1873, when they were removed to their former reservation in the Indian territory. At the W. entrance to the Bolson is situated the mining town of Mapimi, with 5,000 inhabitants. The emperor Maximilian erected a department under this name, with limits differing from those of the desert.

MAPLE, the common name of trees of the genus *acer* (Celtic *ac*, hard), belonging to the natural order *sapindaceæ*, of which with two other genera it forms the suborder *acerineæ*. There are about 50 species, distributed in North America, Europe, northern Asia, Java, and the Himalayas; some are small shrubs and others large trees, frequently with a saccharine sap and rarely with a milky juice; the leaves are opposite, deciduous, simple, palmately three- to seven-lobed, rarely entire. The flowers are in axillary and terminal racemes and usually polygamo-dioecious; *i. e.*, some have stamens only, others pistils only, or both organs may be in the same flower; the usually five-parted calyx is colored and deciduous; petals wanting, or when present as many as the lobes of the calyx; stamens four to twelve, inserted upon a disk; pistil of two united ovaries with two styles; from the back of each ovary grows a wing converting the fruit into two one-seeded keys. Our North American species, of which there are about 10, differ in their time of flowering; in some the flowers appear long before the leaves, others produce their flowers at the time the leaves unfold, and in others they do not appear until after the foliage is well developed.—Our commonest species is the red

or swamp maple (*A. rubrum*); this and the next, the silver maple, flower in March and April, and perfect their seeds about the first of June; when the seeds fall, they germinate in a few days, and by the autumn of the same year form a young tree one or two feet high; this peculiarity must be observed by those who would raise these trees, as the seeds will not retain their vitality if kept until the following spring. The red maple is found in swamps and damp woods from Canada to the gulf of Mexico, and is also known as the soft, the swamp, and the white maple, which last name should be discarded, as it properly belongs to the next species; it is usually a small tree, though it sometimes reaches 60 or 70 ft., with a diameter of 2 or 3 ft.; the young twigs are red, and gradually change to a clear ashy gray. This is a conspicuous tree when in bloom in early spring, as its flowers are produced in such profusion as to make the tree appear at a distance as a mass of color, varying from crimson to scarlet; the individual trees differ much in shade, some being very pale, while others are exceedingly brilliant; the leaves vary greatly in size and shape, and the number and depth of the lobes. The trees with pistillate or perfect flowers produce a profusion of fruit, which makes them objectionable near a garden, as the seeds find their way to every nook and the young maples spring up as weeds. The beauty of our autumn landscape is largely due to the brilliant colors assumed by the foliage of the red maple; it presents every shade of orange, scarlet, and crimson, and these colors, together with green, are frequently to be found upon the same leaf. The wood is white with a tinge of rose color, fine, close, and smooth; it is used for a great variety of turned work and for making the cheaper kind of furniture; it is a useful wood for any purpose if it is not to be exposed to dampness. Some of the trees, in which the fibres take a serpentine course, afford the handsome wood known as curled maple, valued for inside work and for gun stocks; other varieties are known as landscape and mountain maple. As a fuel, the wood of red maple ranks below that of the sugar or rock maple; it burns rapidly and does not make a lasting fire. The bark is used in domestic dyeing, forming with iron salts a good black.—The white or silver maple (*A. dasycarpum*) is more common in the western than in the eastern states, but it is more or less abundant along rivers from Maine to Georgia; as the red maple is often called white maple, the two trees are frequently confounded, but they are readily distinguished by the color of the young twigs, which in this species are green, while in the other they are red, and by the silvery whiteness of the under surface of the leaves, which has given one of its common names to this species. The leaves are usually five-lobed, with the lobes deeply and handsomely toothed; the flowers, which appear before the leaves, are greenish yellow; the fruit,

the early ripening of which has been mentioned, is downy when young, but smooth when ripe; the two wings diverge widely and are about 2 in. long. The tree grows to about 50 or 60 ft. with very spreading limbs; specimens with a circumference of 12, 16, and 18 ft. are recorded, but the usual diameter is about 2 ft. On account of the wide spread of its branches and its fine foliage, this is much valued as a shade and ornamental tree; but as the wood has little strength, the branches are apt to be broken by gales and by accumulations of snow and ice. For planting in prairie countries no tree is more highly prized than this, as by its rapid growth it gives a quick return in valuable fuel. The wood is soft, white, and fine-grained, but it has little strength and is very perishable; hence its use as lumber is limited; as a fuel it is much esteemed.—The most valuable of all our species is the sugar or rock maple (*A. saccharinum*), which is most



Sugar Maple (*Acer saccharinum*).

abundant north of lat. 40° and east of the Mississippi; in the southern states it is found only along the mountains. The tree when young is usually very symmetrical, and indeed somewhat too formal in its outline, but when old it assumes a great diversity of forms, which seem to depend upon soil and situation; it sometimes reaches 70 or 80 ft., but is usually much smaller. The leaves are broader than long, often heart-shaped at base, three- to five-lobed, with the sinuses or spaces between the lobes rounded, while in the two species above mentioned these are acute. The flowers, which appear with the leaves, are greenish yellow, in umbel-like clusters upon very slender hairy pedicels; the fruit, which has a broad wing, ripens in October, and if intended for sowing should be kept through the winter in damp sand. As an ornamental tree the sugar maple has been strangely neglected in this country; its growth is quite slow when young, and nur-

serymen prefer to produce more rapidly growing trees; as a tree to plant in the streets of towns and villages, and along country roads, it has great merit; not the least of its excellent qualities is the great brilliancy of its autumnal colors. The wood is one of the most valuable for fuel, ranking next to hickory, and for charcoal it is esteemed above all others. While the wood of some trees is perfectly straight-grained, that in other specimens presents marked and often elegant varieties; the curled hard maple presents a pleasing surface of light and shade, and the bird's-eye maple has its fibres so singularly contorted as to produce numerous little knots which look like the eye of a bird; these varieties and others are much valued for cabinet work of various kinds and interior finishing, while the straight-grained wood is used for making lasts, buckets, tubs, and a variety of other useful articles; it is also employed in ship building. The sap of this species contains cane sugar, a fact recognized in its common and botanical names; other maples, the birches, hickories, and some other trees, yield sugar, but none of them in such large quantities or in so pure a state as the sugar maple. On many farms a maple orchard or sugar bush, as it is called, is an important part of the property, and yields a good share of the yearly income. The trees are tapped by boring near the ground, a tube, frequently of elder, inserted, and a vessel is set or hung to catch the sap as it trickles out; the flow begins in early spring, often in February, and is most abundant when there are warm days and frosty nights. The process of making the sugar is often very crude, and consists of merely collecting the sap and boiling it down in kettles over an open fire; when sufficiently concentrated the sirup is poured into moulds to granulate. Of late years much more care is given to the manufacture of the sugar, and a house is provided expressly for the purpose, and furnished with improved evaporators and other apparatus to facilitate the operation; there is a large demand for maple sirup, and some makers send all their sugar to market in this form. According to the census of 1870, the total production of maple sugar in the United States was 28,443,645 lbs., in 28 different states, of which the following contributed the largest amounts: New Hampshire, 1,800,704 lbs.; Vermont, 8,894,302; Massachusetts, 899,800; New York, 6,692,040; Pennsylvania, 1,545,917; Virginia and West Virginia, 755,699; Kentucky, 269,416; Ohio, 3,469,128; Indiana, 1,332,332; Wisconsin, 507,192. The total quantity of maple molasses or sirup returned was 921,057 gallons. The black sugar maple, which was described by Michaux as a distinct species, is now regarded as only a variety (var. *nigrum*) of the ordinary sugar maple; the leaves are less deeply lobed, and the whole tree has a darker appearance; it is said to be more productive of sugar.—The striped maple or moosewood (*A. Pennsylvan-*

icum) is a small and slender tree from 12 to 20 ft. high, found in rich woods from Maine to Wisconsin and southward along the mountains; its branches and trunk become striated with dark lines, giving a character by which the tree is readily identified; the leaves are three-lobed at the apex and doubly serrate; the flowers, which do not appear until after the leaves, are in terminal pendulous racemes, and the cluster of fruit is quite conspicuous. In the northern woods the young twigs of this tree are browsed upon in winter by the moose. The wood is regarded as more durable than that of any other maple, but it is too small to be of much value; it is said to reach three or four times its ordinary size if grafted upon the larger species of maple. Its chief value is as an ornamental tree; its ample leaves, which at the time of opening are rose-colored, the striped appearance of the trunk, and the conspicuous flowers and fruit all commend it to the attention of the planter. The mountain maple (*A. spicatum*), found in the same range as the moosewood, is rather a tall shrub than a tree, and forms clumps in moist woods; the three- to five-lobed leaves are downy beneath, and their very long petioles become scarlet in September; the flowers are in terminal, usually erect racemes, and the fruit, which is smaller than in any other of our native species, has very divergent wings.—The large-leaved maple (*A. macrophyllum*) of the Pacific coast is especially abundant in Oregon, associated with the firs and spruces; it is a remarkably graceful tree, from 40 to 90 ft. high, with widely spreading branches and a rough brown bark; it is very conspicuous on account of its very large leaves, which are sometimes a foot broad, though variable in size; they are deeply five-lobed and rather thick; the flowers are in large pendent racemes, yellow and fragrant, and succeeded by clusters of hairy fruit with smooth, slightly diverging wings. The wood of this species is close-grained and hard, and according to Nuttall handsomely veined; it is much valued in Oregon as furnishing almost the only hard wood obtainable in some parts of the state; its sap is said to be abundant and saccharine. This magnificent tree has been so little planted in the Atlantic states that its hardness cannot be considered as fairly tested. Another far western species is the round-leaved maple (*A. circinatum*), called in Oregon the vine maple on account of its manner of growth; in the moist forests several stems spring from the same root and arch over until the tops reach the ground, where they take root and thus form an almost impenetrable thicket; it sometimes grows 20 or 30 ft. high, but has more the habit of a shrub than of a tree. The leaves are heart-shaped, seven- to nine-lobed, about the size of those of the red maple; the flowers are purplish, and the fruit is remarkably divaricate; the wood is heavy, fine-grained, and valued for making handles and other small articles. The smooth maple (*A. glabrum*) of the Rocky moun-

tains is a small shrub with leaves resembling those of the common currant in size and shape; its foliage is variable, and one form has been described as a distinct species, *A. tripartitum*.—Among the exotic species cultivated in this country, the largest and finest is the sycamore maple (*A. pseudo-platanus*); it attains the height of 60 ft. or more, with wide-spreading branches; specimens in England have reached 100 ft. with a diameter of 6 to 9 ft.; its foliage resembles that of the sugar maple, but the leaves are much larger, somewhat downy beneath, and on long reddish petioles; the flowers are in long racemes, and the fruit has only moderately spreading wings; the wood is much esteemed in Europe for turners' work and other uses. There are several varieties of this species, one of which has purple leaves, and another with leaves variegated with yellow. The tree does not well bear transplanting when large. The Norway maple (*A. pla-*



Sycamore Maple (*Acer pseudo-platanus*).

tanoides), from northern Europe, is probably more generally planted, at least in the eastern states, than any other species; though of but slow growth when young, after four or five years from the seed it increases very rapidly, and forms a tree 60 ft. or more high; the contour of the tree is much like that of the sugar maple, and the leaves somewhat resemble those of that species. This tree can be readily distinguished by the milky juice of the leaves, which is best seen on breaking the petiole; the fruit is smooth, the wings diverging in a straight line. It is a most valuable shade tree, especially for streets and avenues; for this use it has some advantages over the sugar maple, as its foliage is more dense, and appears earlier and holds on later; it is remarkably free from the attacks of insects, a fact that has been ascribed to its milky juice. The eagle's-claw and the shred-leaved maples are accidental forms of this. The common European or English

field maple (*A. campestre*), as seen in this country, is scarcely more than a bush, seldom above 10 or 15 ft. high; in the south of Europe it grows much larger; its heart-shaped leaves



Common European Maple (*Acer campestre*).

are 2 to 3 in. broad, and five-lobed; flowers in short erect clusters and wings of the fruit diverging horizontally; there are several named varieties which differ from the type in foliage; the wood makes excellent fuel, and when large enough is used for cabinet and other work. Its chief value with us is as a lawn tree; it makes a regular and formal growth, and when well developed and branching to the ground presents a dense mass of foliage as broad as it is high. The Candian (*A. Creticum*), almost an evergreen, the Tartarian (*A. Tartaricum*), the Montpellier (*A. Monsperulanum*), and the Colchian Maple (*A. Colchicum*), and some others, are met with in collections of rare trees. A highly ornamental class of maples is found in Japan, several of which have been introduced into this country by Mr. Thomas Hogg; these include varieties of *A. palmatum*, *A. polymorphum*, and others of which the species are not determined; they present a great variety in the lobing and dissection of their leaves and the most exquisite variegations in color.—The ash-leaved maple, called *acer negundo* by Linnæus and Michaux, is now placed in a separate genus, *negundo*, which differs from *acer* in having perfectly dioecious flowers and pinnate leaves. There are but three or four species of this genus, which is peculiar to North America and Japan. The common species is *N. aceroides*, which is found from the Red river of the North to North Carolina, but mainly westward, and is more abundant on the banks of streams than elsewhere. It is a rapid-growing tree when young, but is short-lived on dry soils; in favorable situations it becomes a fine tree 40 to 60 ft. high, but is usually much smaller; it forms a handsome round head with

dense foliage; its compound leaves have three or five leaflets, which are ovate, pointed, and toothed; the staminate flowers are in small clusters, and the pistillate ones in racemes, which later are several inches long and conspicuous on account of the numerous fruits, like those of the maple, with incurved wings. The wood is similar to that of the red maple, and useful for fuel. The abundant sap yields sugar, and it is by some regarded as purer than that afforded by the sugar maple. This tree is in the western states generally called box-elder, and is a favorite with those engaged in tree planting upon the prairies, a purpose for which its rapid growth well adapts it; and though not long-lived, it will furnish both fuel and sugar while slower but more valuable kinds are growing. It is much valued as an ornamental tree, its symmetrical growth and neat habit making it suitable for the lawn. A variegated form of this has been recently introduced, in



Ash-leaved Maple (*Negundo aceroides*).

which the leaves are abundantly marked with white; a specimen of this seen against a background of evergreens produces a striking effect in landscape gardening.

MAQUET, Auguste, a French novelist, born in Paris in 1813. He studied and taught at the collège Charlemagne, and wrote for Alexandre Dumas parts of many works which the latter claimed exclusively as his own. In 1846, however, Maquet's pamphlet, *La maison Alexandre Dumas et compagnie*, forced Dumas to acknowledge his share in these productions; and in 1851 they dissolved their literary partnership. Maquet has published *La belle Gabrielle* (5 vols., 1853-'5); *Le comte de Lavernie* (10 vols., 1853-'5); *La maison du baigneur* (2 vols., 1856); *L'encens et l'encens* (4 vols., 1858); and *La rose blanche* (3 vols., 1859). Among the novels ostensibly by Dumas, the best known of those in the writing of which Maquet had a considerable if not the principal share are *Les*

trois mousquetaires, *Vingt ans après*, *Le vicomte de Bragelonne*, *Monte Cristo*, and *Joseph Balsamo*. He took the same share in dramatizing some of these novels, chiefly in conjunction with Dumas, but also with Jules Lacroix.

MARABOU, the popular name of several large birds of the stork family, of the genus *leptoptilus* (Lesson), natives of Asia and Africa, whose delicate vent feathers were formerly highly esteemed as ornaments. The *L. argala* (Lath.), the Asiatic marabou or adjutant, has no equal in size except the jabiru and ostrich; the length from the point of the bill to the claws is $7\frac{1}{2}$ ft., and the expanse of wings is nearly 15 ft.; it stands 5 ft. high. The bill is about 2 ft. long, straight, strong, and sharp-pointed; the wings long and ample, the tail moderate and broad, tarsi strong, and toes long, the anterior webbed at the base. The head and neck are nearly bare of feathers, and in front of the neck hangs a pouch or dewlap several inches long and capable of considerable distention. The bill is yellowish white, and its gape is such that it can swallow whole an animal as large as a cat; front of the neck yellowish, back of neck reddish with a few hairy warty excrescences; the back and wing coverts deep bluish ash, wings dusky, breast and belly dusky white; the feathers of the sides beneath the wings, and those of the vent and under tail coverts, are whitish, downy, about 12 in. long, and so light and delicate as to command a high price for ladies' head dresses; a feather a foot long and 7 in. wide weighs only 8 grains. It is common in Bengal, and by the natives each is believed to be possessed by the soul of a Brahman; by the English it is called adjutant from its resemblance to a dis-



Marabou (*Leptoptilus marabou*)

tance to an officer with white waistcoat and breeches. Its voracity is extreme, exercised upon anything which comes in its way, from offal, fish, and reptiles, to birds and quad-

rupeds, and even to the cooked meats of the natives; its services are valuable as a scavenger, and its presence is encouraged; it has even been domesticated. In the wild state, they live in small flocks near the mouths of rivers; their power of flight is great, and their vision very keen. A smaller species (*L. marabou*, Temm.) occurs in tropical Africa, assisting the vultures in consuming the filth of the negro villages; it is more ugly, if possible, than the Asiatic bird, and its delicate plumes are equally valued; *marabou* is the native African name. Other species are described, with similar characters.

MARACAYBO, or Maracaibo. **I.** A city of Venezuela, capital of the state of Zulia (formerly Maracaybo), situated on the W. shore of a channel connecting the lake and gulf of the same name, about 25 m. from the gulf, and 300 m. W. of Caracas; lat. $10^{\circ} 40' N.$, lon. $71^{\circ} 40' W.$; pop. about 15,000. The city is built on a dry sandy soil, and the N. portion, upon a rising ground, commands a fine view of the lake. The houses, a few of which are handsome, are for the most part of chalk and sand, or of wood, and covered with reeds. The harbor is commodious and well defended by three forts; but, owing to the bar at the entrance, only vessels drawing less than 10 ft. can come up to the town. The climate is excessively hot, but more salubrious than that of the lowland towns of the eastern and inland states. Heavy rain falls from May to November; and in the other months violent and even disastrous rains, accompanied by terrific lightning and thunder, are not infrequent, but hurricanes are unknown. Earthquakes are common. The principal articles of export are cacao, cotton, sugar, fustic, and coffee; of the last 23,000,000 lbs. were exported in the year ending June 30, 1872. Cattle are reared in large numbers in the surrounding country. Ship building, for which a dockyard in the port offers superior facilities, is extensively carried on. There is an important coasting trade. The foreign trade is mostly in the hands of English, French, and Germans.—This city was founded in 1571 by Alonso Pacheco, who named it Zamora; it was afterward called Maracaybo, after a powerful cacique of the lake region. It has frequently suffered by fire and earthquakes. **II. Lake of,** a large lagoon or inlet of the sea, in shape resembling a guitar, lying immediately S. of the city; length, nearly 100 m.; greatest breadth, 75 m. The channel connecting the lake with the sea is 45 m. long and from 4 to 14 m. wide, and deep enough except over the bar at its mouth for the largest vessels. The shores of the lake are low and barren, and at certain seasons inundated to a distance of 10 or 20 m. Its waters, being fed by about 500 small streams (only about 100 of which however are perennial), are generally fresh when the S. wind prevails; at other times they are brackish. On the N. E. shore is a mine of mineral pitch, which at night during the hottest months emits

a brilliant phosphoric light resembling lightning, and called by navigators the lighthouse (*faro*) of Maracaybo. The carrying trade on the lake is done by schooners; but it is now proposed to establish also one or two lines of steamers. **III. Gulf of.** See VENEZUELA.

MARAJÓ, or Joannes, an island of Brazil, in the mouth of the Amazon, which it divides into two unequal branches; length about 180 m., greatest breadth about 150 m.; pop. about 20,000, almost exclusively Indians. The land is generally low and flat, and is watered by several navigable rivers and a number of small streams; the principal of the former are the Moudin, with a course of about 50 m., and the Arajáz, of 60 m. The climate is similar to that of the province of Grão Pará. The soil, though marshy, favors the cultivation of most of the tropical products, especially rice, which is grown in prodigious quantities; but the principal occupation of the people is the rearing of cattle, which find excellent pasture in the vast prairies of the island.—Marajó was first given to Antonio de Souza de Macedo, baron Joannes, and was long known by his name. The Tupinambá Indians, who inhabited it, were civilized by the Jesuit priest Antonio Vieira; they were celebrated canoe builders and coasters. The island was united to the province of Grão Pará about 1830.

MARANHÃO, or Maranhão. **I.** A N. E. province of Brazil, bounded N. by the Atlantic, E. by the province of Piauí, S. W. by Goyaz, and W. by Grão Pará; area, 168,000 sq. m.; pop. about 385,000, consisting chiefly of Indians. The coast line is very regular to the east; but about the middle it is deeply indented by the vast bays of São José and São Marcos, between which lies the island of Maranhão, opposite the embouchures of the Maranhão and Itapicuri rivers; still further W. occur at short intervals the bays of Cuma, Cabello, and Turiassá, the last forming the mouth of the river of the same name. From this point to the extreme west, and indeed to the mouth of the Pará, or more properly the Amazon, the shore is fringed with innumerable islets, keys, and reefs. The coast of Maranhão is mainly low and flat; high red cliffs border the shore of the island, and of the mainland to a considerable distance westward. The principal elevations are in the southwest and south, whence low parallel ridges slope almost due N., where they sink into extensive plains. Of the numerous rivers the largest are the Parnahyba, forming the entire E. boundary, and receiving a host of important tributaries from the southern corner of the province; the Itapicuri, Mearim, and Pindaré, all navigable nearly to their sources, and the last two uniting 15 m. N. of the town of Mearim to form the Maranhão; the Turiassá and the Gurupi, separating the province from that of Grão Pará; while the S. W. boundary line is constituted by the Tocantins and its N. E. affluent the Manoel Alves Grande. A great part of the country is densely wood-

ed, but in the interior occur some extensive campos and alluvial flats, which are frequently inundated. Gold mining on a large scale was attempted at Marcassumé, but was abandoned about 1867. Silver, platinum, rich copper ore, antimony, and arsenic have been discovered in many parts; iron is general throughout the province; there is petroleum on the Itapicuré; sulphur is said to exist at Rosario, and saltpetre and hydraulic lime at Alcantara and Guarajú; and about 60,000 tons of salt are annually produced on the Alcantara coast. The climate is hot and damp, like that of the Amazonian valley, of which, according to Agassiz, it once formed a part; the thermometer ranges from 69°S to 97°S F. The light rains begin in October, but the rainy season sets in in December and lasts till May, with much thunder and lightning, especially toward the close; and from June to December the general winds blow steadily from the northeast by day, and from the east by night. The principal products are rice, cotton, sugar, and coffee; the last is now abundantly grown on the mountain slopes inland, and will probably soon take the place of cotton as a staple for exportation. Oils of various kinds are extensively extracted, but mostly for domestic use, except copaiva, the annual production of which is about 100 pipes; and sarsaparilla, annatto, vanilla, cajú rosin, and many valuable medicinal plants are found in great plenty, but have not yet become important commodities. In 1854, 13,000,000 lbs. of cotton were exported, valued at \$987,197; and in 1869, 12,500,000 lbs., valued at \$1,784,955. The total value of exports in 1867 was \$3,150,426, and of imports (consisting mainly of machinery and manufactured goods) \$2,712,560. *Manteiga de tartaruga*, a kind of butter from tortoise eggs, is extensively manufactured. There are three foundries and one machine shop; superior embroideries and laces are made; but the larger portion of the inhabitants are engaged in agricultural pursuits. Maranhão has eight cities and 28 towns; the more important of the former, besides the capital, are Caxias, Vianna, and Alcantara. Education is here more general than in any other province of the empire, there being a lyceum with 12 chairs of languages, sciences, and law, several seminaries, and numerous other schools. Maranhão has produced many of the most prominent Brazilian men of letters, arts, and sciences.

II. San Luiz de Maranhão, a maritime city, capital of the province, on the W. side of the island of the same name, lying at the mouths of the Itapicuré and Maranhão rivers, 1,410 m. N. of Rio de Janeiro; lat. 2° 31' S., lon. 44° 18' W.; pop. of the island in 1872, 34,023, of whom about 30,000 were in the city. The city is defended by a line of high red cliffs skirting the shore of the island to the north, from which direction it is accessible only by narrow passes. The streets are regularly laid out, are spacious, well paved, and lighted with gas. The houses

are well built, many of them being of two stories, and surrounded with gardens. The finest of the public buildings are the cathedral and the episcopal palace, both the work of the Jesuits. There are ten other churches and chapels, eight convents, the governor's house, town hall, custom house, post office, prison, and one military, one foundling, and several general hospitals. The benevolent institutions comprise asylums for orphans and indigent females, besides several societies for the protection and relief of artisans. There are two banks, several mercantile and industrial associations, and a number of insurance companies. The educational establishments are a lyceum in which are taught languages, sciences, law, and philosophy, two seminaries, and many primary and grammar schools. The public library contains about 10,000 volumes. Eight periodicals are published. A botanic garden has lately been established. The climate is extremely hot and unhealthy.—Maranhão is the entrepot for the productions of its own province and those of Grão Pará, Piahy, Rio Grande do Norte, and Ceará. The port is easy of access, well defended by a series of forts, and affords good anchorage for vessels drawing 20 ft. of water. The exports and imports for the second half of 1871 amounted to \$1,021,468 64 and \$1,063,225 30 respectively. In 1870 there were exported 12,133,000 lbs. of cotton and 6,338,280 lbs. of sugar. Among other exports are hides, balsam copaiva, and unprepared isinglass. The chief imports are manufactured goods and machinery. Half of the foreign trade is with Great Britain, and about one tenth with Portugal. The maritime statistics for the year ending June 30, 1872, were: entered, 40 steamers and 36 sailing vessels, tonnage 44,272; cleared, 39 steamers and 51 sailing vessels, tonnage 52,230. Besides a direct line of steamers to Lisbon and Liverpool, there are two touching at Ceará and Belem or Pará, all established since 1867, and almost monopolizing the carrying trade between Maranhão and Europe. The rivers Itapicuré, Meirim, and Pindaré are navigated by steamers, and there are also coasting lines to Rio de Janeiro and to Pará.—Maranhão was founded in 1612.

MARANHÃO RIVER. See MEARIM.

MARANON. See AMAZON.

MARAT, Jean Paul, a French revolutionist, born of Protestant parents at Baudry, near Neuchâtel, Switzerland, May 24, 1744, assassinated in Paris, July 13, 1793. He was educated as a physician; but the narrow sphere in which he lived offering scanty means to satisfy his ambition, he went abroad. At 30 years of age he was at Edinburgh, where he obtained a living as private tutor, and published a revolutionary pamphlet in English, entitled "The Chains of Slavery," which appeared in French at Paris in 1792 (latest ed., 1850). In the following year, by a more voluminous publication, *De l'homme, ou des principes et des lois de l'influence de l'âme sur le*

corps et du corps sur l'âme (3 vols., Amsterdam, 1775), he appeared as an opponent of Voltaire, and a literary controversy ensued between them. He removed to Paris, and from 1779 to 1788 published a series of writings, in which he attempted to revolutionize natural philosophy, and to refute the Newtonian theory. His success being far inferior to his pretensions, he relinquished the field of literature and endeavored to establish himself as a physician; but after many disappointments he was obliged to accept a position as veterinary surgeon to the count of Artois, afterward Charles X. The outbreak of the revolution gave him the opportunity to play the part of a demagogue. Although physically not prepossessing, being hardly five feet high, with a strange mixture of the ludicrous and terrible in his countenance, he soon obtained a vast influence over the lower classes by his energy and resolution. On Sept. 12, 1789, he published the first number of the *Publiciste Parisien*, the title of which was afterward changed into *Ami du Peuple*. As early as August of that year he had publicly proclaimed that 800 members of the national assembly ought to be hanged, Mirabeau the foremost among them. In the same spirit every page of the *Ami du Peuple* was written. This journal, under the successive titles *Le Journal de la République Française* and *Le Publiciste de la République Française*, was continued without interruption till July 14, 1793. At the same time he also published several revolutionary pamphlets, and 13 numbers of a political journal entitled *Le Junius Français*. Having been introduced by Danton into the club of the Cordeliers, he created there disturbances so violent that the municipality ordered his arrest in January, 1790. He evaded it by secreting himself in the cellars of the Cordeliers, whence he continued to issue his periodical. After the king's unsuccessful attempt at flight, Marat again ventured into publicity, and directed his attacks against the Girondists. Having been prosecuted in consequence, he returned to his former underground haunts, from which he again emerged in the riots of August, 1792. He now became the right-hand man of Danton, then minister of justice, introduced himself into the vigilance committee established by the municipality of Paris, and was one of the chief instigators of the massacres of September. To reward him for the part he had taken in these atrocities, the people of Paris elected him to the national convention. Here his speeches were received by the party of the majority with a feeling of abhorrence mingled with contempt. They moved a vote of censure against him for having advocated the establishment of a dictatorial power. When, after angry discussions, the motion was at last withdrawn, Marat produced a pistol from his pocket, exclaiming that, if the motion had passed, he would have blown his brains out in the presence of the convention. Emboldened by impunity, he grew more fanatical every day,

and his paper denounced the French generals and armies as incapable, and asked for the heads of 270,000 "traitors," and the massacre of three fourths of the members of the convention. In vain the Girondists endeavored to break down his influence. Under the pressure of popular excitement, created by foreign intervention, the ultra-revolutionary party had gradually obtained the ascendancy, and the most sanguinary proceedings being considered unavoidable in order to prevent a coöperation of the anti-revolutionary elements with the foreign foe, Marat, who excelled all others in this respect, was almost adored by the Parisians as the saviour of the country. Thus, in April, 1793, he succeeded in obtaining the passage of a "law for the arrest of suspicious persons," by the operations of which no fewer than 400,000 individuals were imprisoned throughout France. Having, as chairman of the Jacobin club, signed an address to the people, in which the assassination of the Girondists was openly called for, he was prosecuted before the revolutionary tribunal. But his trial became a triumph. The public prosecutor, the jurors, and the audience did him homage, and he was carried in triumph to the national convention, where Danton delivered an eloquent eulogy in his honor. He now rapidly rose to the culminating point of his career. Having made the municipality subservient to his plans, he instigated the mob of May 31, 1793, by which the Girondist party was completely destroyed. With Robespierre and Danton he formed a triumvirate, which for the time determined the destinies of France. Confined by disease in his garret, Marat was restlessly active in stirring up, by letters and denunciations, the passions of the people and of the national convention. He was finally assassinated by Charlotte Corday, while preparing a list of Girondists to be sacrificed to the common weal, only a few days before his life would probably have ended from natural causes. (See CORDAY.) Robespierre used his death as a pretext for carrying the reign of terror to its utmost extent. Hundreds of victims were sacrificed to the "manes of the martyr." The entire national convention attended his funeral. His body was transferred, Nov. 4, 1793, to the Pantheon, and his portrait, executed by David, adorned the hall of the convention. A pension for life was voted by the "grateful nation" to his concubine. Two years later, when the revolutionary passions had cooled down, the remains of Marat were removed from their resting place and his portrait taken down. Though vain and egotistic, Marat was doubtless sincere in his sanguinary ravings, and was so disinterested that, even in the height of his power, he lived in the most abject poverty.

MARATHON, a town of Greece, near the E. coast of Attica, about 18 m. N. E. of Athens, near which the Persians under Datis and Artaphernes were defeated, in 490 B. C. (Sept. 28 or 29, according to somewhat uncertain compu-

tations), by the Greeks under Miltiades. The Persians, having crossed the Ægean and taken Eretria in Eubœa, passed over to Attica, landing on the plain of Marathon; their numbers were about 110,000. To oppose them was an Athenian force of 10,000 heavy-armed infantry and a small body of light-armed troops and attendants. According to Athenian law, there were ten generals, each of whom in turn was entitled to command for a day; but the other generals waived their authority in favor of Miltiades, who thus became sole commander. Having received a reinforcement of 1,000 heavy-armed Plateans, Miltiades resolved to sally from his strong position on the heights and attack the Persians, who were crowded in the plain. So little was an attack anticipated that it was really a surprise. The Greeks advanced in three bodies, a centre and two wings, with a considerable interval between. Both attacks by the wings were successful, and the enemy was driven to the right and left; but in the centre the heavy masses of the Persians repelled the Athenians, who were forced back for a considerable space. Miltiades then recalled his victorious wings, which fell upon the flanks of the Persian centre; this was speedily broken, and the whole army fled in rout to their ships, which were drawn up on the beach. The Persian loss was 6,400, that of the Greeks only 192. A tumulus, still standing near the modern village of Vrana, which probably occupies the site of the ancient Marathon, marks the burial place of the Greeks who fell in this action. The battle of Marathon is justly considered one of the most important in history, not so much on account of the numbers engaged or the losses incurred, as for its historical results. Had the Athenians been defeated, there was no power capable of resisting the Persian invasion, and Greece must have become a Persian satrapy.

MARATHON, a N. county of Wisconsin, bordering on Michigan, and drained by the Wisconsin river and its branches; area, 6,048 sq. m.; pop. in 1870, 5,885. It has a diversified surface, extensive pine forests, and numerous small lakes. The chief productions in 1870 were 35,327 bushels of wheat, 76,482 of oats, 22,164 of potatoes, 8,385 of peas and beans, and 2,843 tons of hay. There were 273 horses, 1,331 milch cows, 2,754 other cattle, 1,482 sheep, and 1,215 swine. Capital, Wausau.

MARATTI, Carlo, an Italian painter, born near Ancona in 1625, died in Rome, Dec. 15, 1713. At about the age of 12 he was sent to Rome and put under the instruction of Andrea Sacchi, with whom he remained eight years. He became a student of the works of Raphael, and his contemporaries, supposing that he could only paint madonnas, called him *Carluccio delle Madonne*; but he silenced their sneers by executing for the baptistery of St. John Lateran a picture of Constantine destroying the idols, which caused him to rank among the first painters of the day. He restored the frescoes

of Raphael in the Vatican, and those of Annibale Carracci in the Farnese palace. His masterpiece is the "Martyrdom of St. Biagio" at Genoa. He also executed several etchings from his own designs and from Italian masters.

MARBEAU, Jean Baptiste François, a French philanthropist, born at Brives in 1798. He became an advocate in Paris, and published in 1824 a treatise on proceedings at civil law, and in 1834 one in the interest of the working classes. In 1844 appeared his *Études sur l'économie sociale*. In the same year he was appointed adjunct mayor, and founded the first infant asylum (*crèche*) at Chaillot. He set forth the utility of such institutions in *Des crèches* (1845), which has had many editions and translations, and obtained a Montyon prize of 3,000 francs, which he appropriated to one of the principal asylums. His beneficent enterprise led to the establishment of hundreds of infant asylums all over France.

MARBECK, John, an English composer, born early in the 16th century, died about 1585. He was one of the earliest composers of the reformed church of England. About 1544 there were formed at Windsor associations in support of the Lutheran doctrines. Marbeck, then organist at St. George's chapel, Windsor, lent his support to one of these, and with three other members was seized on a charge of heresy. An examination of his papers discovered a concordance to the English Bible, complete as far as the letter L. The special charge against him was for copying an epistle of Calvin's against the mass. All four were condemned to be burned, but Marbeck was saved through the influence of the bishop of Winchester, and resumed his post as organist. He finished his "Concordance," the first complete one ever made, and published it (fol., London, 1550). He also published "The Boke of Common Praier, noted" (4to, 1550), the oldest published for the use of the Anglican church. Robert Jones of Ely cathedral issued a new edition of this work, entitled "Marbeck's Book of Common Prayer for voices in unison, arranged for modern use, with an *ad libitum* organ bass accompaniment." The work unaltered was reprinted in London in 1844. Smith's *Musica Antiqua*, in the collection of the British museum, contains a *Te Deum* and a mass for five voices by Marbeck. His other works are: "The Lyves of Holy Saintes, Prophets, Patriarches, and others" (4to, 1574); "The Holie Historie of King David, drawn into English Meetre" (4to, 1579); and "A Ripping up of the Pope's Fardel" (8vo, 1581).

MARBLE, a rock used as an ornamental building stone, for interior decorations, and for sculpture. Generally, any limestone that can be obtained in large sound blocks, and is susceptible of a good polish, is marble; and the only marble that is not limestone is the serpentine and the oriental verd antique (the latter a mixture of serpentine and limestone). It is found in beds in various geological forma-

tions. In the azoic group it is a metamorphic rock of granular and crystalline structure, and often presents a fineness of texture and purity of shading that fit it for the choicest works of the sculptor. In the palæozoic formations it bears more of the character of a sedimentary rock, and it is apt to contain organic vestiges, as corallines and fossil shells, which indeed sometimes compose nearly its whole substance; it is also of variegated colors, and sometimes is of brecciated structure, evidently made up of fragments of an older rock, the layers of which, broken up and confusedly rearranged, have been cemented together. Though thus varying greatly in color, texture, and structure, the composition of marble is for the most part essentially the same; it is a carbonate of lime, or a combined carbonate of lime and carbonate of magnesia, and is readily burned to quicklime. It is soft and easy to work with the chisel or hammer, generally of even grain, so as to be split with wedges, and of specific gravity about 2.7, making the weight of a cubic foot about 169 lbs. Its durability is very variable, some varieties retaining sharp edges when exposed for many years to the weather, and others soon crumbling away.—Many varieties of marble have acquired a name and celebrity from remote times. The ease with which the rock is worked caused it to be selected for the earliest structures. The names of many marbles famous among the ancient Greeks and Romans are still retained, and their localities are known. Mt. Pentelicus in Attica furnished the valuable Pentelican white marble, called by the moderns Penteli marble; the islands of Paros and Naxos, the still celebrated Parian marble; and other similar white marbles came from Mt. Hymettus in Attica, from Thasos and Lesbos, from Corallus in Phrygia, from Cyzicus on the Propontis, and one variety, exceeding the Parian in whiteness, from Luna in Etruria. Of the first named (the Pentelican) the Parthenon was built, and also the temple of Ceres at Eleusis, besides many celebrated statues. Though of finer grain than the Parian, it is said not to retain its polish and beauty so well. The Parian marble is placed first by both Theophrastus and Pliny in their enumeration of ancient marbles. Pindar and Theocritus also celebrated its praise. The statues of Venus de' Medici, Diana Venatrix, the Oxford marbles known as the Parian chronicle, and many other famous works, are of this marble. Black marbles are occasionally referred to by the ancients; but some of those named, as the *Chium marmor* from the island of Chios, appear to be of questionable character. This one is sometimes called *lapis obsidianus antiquorum*. It was glossy black, and received so high a polish that it was made into mirrors. The green marbles were serpentines from various localities. Yellow marble was obtained at Corinth. The *marmor Phengites* of Cappadocia was white with yellow spots; the Rhodian was marked with gold-colored spots, and that of Melos (Milo) was

yellow.—The marbles of modern times have been variously classified and named. In southern Europe two general divisions are made of antique and modern. The quarries of the former being lost or abandoned, the stone is obtained only from ancient monuments; and being consequently most highly prized, methods are resorted to, and sometimes with success, to attach the name antique to stone from quarries now worked. It is also the case that some of the marbles held in the highest estimation in France, being transported from monuments at Rome, are the product of quarries worked in ancient times in France. It is probable these might be again discovered. Without reference to these marbles, however, the French boast that their country surpasses even Italy in the beauty and variety of this class of stones.—The following are convenient divisions in which marbles may be arranged for a general notice of the most important of them: 1, the simple or single-colored marbles; 2, the variegated; 3, the brecciated; 4, the lumachella or fossiliferous. These sorts, however, pass into each other, so that some may be placed indifferently either in one or the other of two groups. 1. The best known of the first class are the plain white marbles, some of which have been already named. The white marble of Carrara, of which an account is given in the article CARRARA MARBLE, is of a texture like loaf sugar, differing in this respect from the Parian marble, which on close examination appears to be made up of the most delicate plates or scales, confusedly but most closely united together. Pure black marble is found in some ancient Roman sculptures. Some varieties of it are obtained in Derbyshire, England, and in Kilkenny, Ireland; but as the latter is more or less intermixed with fossil shells, it should come under the fourth division. It is quarried in the United States at Shoreham, Vt., and Glen's Falls, N. Y., and specimens are obtained from some other localities. The colored marbles are generally variegated; but the Siena marble of Italy is sometimes of a uniform yellow color, or the same clouded. Some of the red marbles of Italy also display only the one color. In North America white marbles are worked at various places on the range of the great belt of metamorphic rocks through Canada, Vermont, western Massachusetts, a little back of the cities of New York, Philadelphia, Baltimore, and Washington, and thence through Virginia and the Carolinas into northern Georgia and Alabama. It is this formation that supplies the white marble for building purposes to the different cities along its range, and its quarries in Massachusetts and New York furnish the marble for the most costly edifices of southern cities. The statuary marble is only the finest grained variety of this common building stone. Many localities are known to furnish it in small beds interstratified with the coarser marble. Several quarries of fine statuary marble have been opened in Vermont. The first were at Rut-

land, but other localities have since been found. Excellent quarries are also found in other parts of the United States. 2. The variegated marbles are those variously spotted, shaded, and veined. They are the most numerous class, and include the most beautiful of the colored marbles. None are more highly esteemed than the variegated yellow marble of Siena. This and the Italian dark red marbles may be seen in many of the costly mantels in our marble shops; and also the soft, shaded, dove-colored Lisbon marble, of which are made the smaller columns in the entrance of the Unitarian church at the corner of 4th avenue and 20th street, New York. The black Genoese marble, with golden-colored and white veins, called Portoro marble, the best of which is from Porto Venese, has for many years past been the most popular and the best known foreign marble in all parts of the United States, though now rather out of fashion. It is a weak stone, and is for the most part used in thin slabs cemented upon a back of slate. The marbles of this class found in the United States east of the Rocky mountains have not attained much celebrity, nor do we know of any worthy of it, unless we should include among them certain varieties of the brecciated marbles from northern Vermont and Tennessee. The gray and white clouded limestones of Thomaston, Me., are quarried to considerable extent for marble, and may be seen in common use in portions of the eastern states. They possess little beauty. California has furnished of this class some very showy marble of brilliant reddish and brownish colors, and susceptible of a high polish. It is imported into New York and used for mantels. 3. The brecciated marbles are composed of angular fragments, it may be of various mineral substances, united in a bed or paste of calcareous cement; or the mass may be so divided by numerous veins into pieces as to present the appearance of broken fragments irregularly united. Brocatellas are breccias, in which the fragments are very small; we incorrectly apply the name only to a reddish brecciated marble brought to this country from Spain. The varieties of this class are very numerous; but some of the most celebrated are never seen here, such as those called *le grand deuil* and *le petit deuil*, literally the full mourning and the half mourning. These come from the Pyrenees and different parts of France; they are of a black ground spotted with white fragments. Among the brecciated marbles of the United States, the best known is that of the Potomac on the Maryland side, some miles below the Point of Rocks. The principal use that has been made of it was to furnish the columns in the old chamber of representatives at Washington. The irregularities of hardness in the different ingredients render it an expensive stone to work; still the quarries are deserving of more than government patronage. The stone is certainly handsomer than the Italian red and white breccia imported for the

inner columns of the central arched entrance of the church before mentioned. Quarries have been opened in the northern part of Vermont, near Lake Champlain, which produce the most beautiful of the American colored marbles. They are brecciated, though they pass into the variegated. They present a great variety of colors, from a deep red, traversed with veins of white, to rose-tinted flesh color mottled with whitish spots. In some specimens the brecciated structure is very strongly marked, the fragments being large with sharp edges and of decided shades of dark red, drab, and salmon, upon a ground of white bordered with rose. Unlike the Potomac marble, the fragments are not different varieties of rock, but are all limestone. The stone, though somewhat hard for marble, is still of uniform texture and takes an even high polish. Some large blocks closely resemble the foreign brocatella. It is however very difficult to work. Other marbles of this character and of rather dark red colors abound near Knoxville, Tenn., and have been brought into notice by the extent to which they are employed in the construction of the capitol at Washington. 4. Lumachella or fossiliferous marbles are those which contain petrified shells. These are sometimes so crowded upon one another, that they compose the whole mass of the stone; sometimes single shells are seen scattered throughout the block. These marbles are very abundant in Europe, and also throughout New York and the western states. Handsome mantels are made of American varieties which are composed entirely of fossil shells, but they are rather to be regarded as curious than beautiful. They lack the high colors of the brecciated and variegated marbles, and though they take a good polish, they are from their plain colors comparatively dull and sombre. Some of the best of the kind is from Becraft's mountain, back of Hudson, N. Y., which is thus noticed by Prof. Silliman ("American Journal of Science," vol. vi., p. 371): "The marble is of a grayish color with a slight blush of red; its structure is semi-crystalline, and in some places highly crystalline, especially in and around the organized bodies which in vast numbers it embraces. The large slabs present a great diversity of appearance, and can scarcely be distinguished from the similar transition marble of the Peak of Derbyshire, which it quite equals in beauty and firmness."—Serpentine, as before stated, differs in composition from the other marbles. It consists of about equal parts of silica and magnesia with 12 per cent. of water. It is a soft mineral of different shades of green, of waxy lustre, and susceptible of a high polish. It is better adapted to ornamental work within doors than to be exposed to the action of the weather. Verd antique is a mixture of green serpentine and light-colored limestone. These varieties come from Genoa and Tuscany, and the best verd antique from Egypt. In Vermont and Canada serpentine abounds;

and verd antique may be obtained in various places in New York and Pennsylvania, and in any of the New England states. At Milford, Conn., a quarry of serpentine and verd antique was worked more than 50 years ago, which furnished slabs pronounced by good judges quite as fine as the European stone.—The methods of preparing marble for use differ from the working of granite. This hard rock, after being quarried, is split by small wedges driven into holes drilled in a line, and is then dressed by hammers or used in the rough. Marble, being a comparatively soft rock, is cut into slabs by a process of sawing with smooth iron saws fed with sharp sand and water. Several of these plates or saws are set in one frame, and in a large establishment 20 or more of the frames may be seen kept in steady operation by a steam engine. The progress of the saws cutting down through the great blocks of marble seems very slow, for the most part not exceeding an inch per hour. The thickness of the slabs is usually four or six inches. In this form the marble is used for facing the walls of buildings upon a back of brick, giving all the effect of a solid wall of marble at much reduced cost. In the most expensive structures only are the walls built of solid blocks of marble or freestone. Marble slabs for mantels and other interior work are sawed like those for building, and are then rubbed smooth upon a heavy revolving table of cast iron, called the rubbing bed, and afterward polished.—According to the census of 1870, there were 22 marble quarries in operation in the United States, employing a capital of \$1,316,600. The total products amounted to \$804,300. The most extensive quarries were in Maryland, where the products for the year were valued at \$275,000; New York, \$222,000; Vermont, \$130,800; Pennsylvania, \$101,000; and Massachusetts, \$59,500. Marble valued at \$3,799,518 was worked into monuments and tombstones, valued at \$8,916,654. The value of marble and stone and manufactures thereof, imported into the United States during the year ending June 30, 1873, was \$1,099,280, of which \$423,818 was from Italy.

MARBLE, Manton, an American journalist, born in Worcester, Mass., Nov. 16, 1835. He graduated at the university of Rochester in 1855, was soon after connected with the Boston "Journal," and subsequently was editor of the Boston "Traveller." In 1858 he went to New York and joined the staff of the "Evening Post." In 1859 he made a trip to Red river and beyond, corresponding with the "Evening Post," and contributing three papers descriptive of the journey to "Harper's Magazine." He has been connected with "The World" newspaper from its establishment, June 16, 1860, and became its proprietor and editor in April, 1862, making it a free-trade and democratic journal.

MARBLEHEAD, a town and port of entry of Essex co., Massachusetts, at the terminus of a

branch of the Eastern railroad, 12 m. N. E. of Boston; pop. in 1870, 7,703. It is built upon a peninsula projecting into Massachusetts bay, about 4 m. in length and 2 in breadth, with an area of about 3,700 acres, and joins Salem on the west. The surface is elevated, and is exceedingly irregular and rocky. The harbor is deep and convenient, and is about $1\frac{1}{2}$ m. long by $\frac{1}{2}$ m. wide. The town has been noted from the first settlement of New England for the enterprise of its people in the fisheries. More recently the inhabitants have also engaged extensively in the manufacture of boots and shoes. For the year ending June 30, 1873, the number of vessels engaged in the cod and mackerel fisheries was 59, with an aggregate tonnage of 2,098; belonging to the port, 64 vessels, of 2,554 tons. There are two national banks, a savings bank, graded public schools, with a high school, a weekly newspaper, and eight churches.—Marblehead was originally a part of Salem, and was incorporated as a distinct town in 1649, at which time it contained 44 families. Many of the settlers were from the Channel islands; and their peculiarities of language are still to be noticed among the inhabitants, and formerly existed to such a degree as almost to constitute a separate dialect. At the commencement of the revolutionary war Marblehead was reckoned the second town in Massachusetts in population and wealth. It contributed a regiment of 1,000 men to the army, and at the end of the war there were 600 widows and 1,000 fatherless children in its population of less than 4,000. During the war of 1812 the frigate Constitution was chiefly manned by men from Marblehead, and the town also sent out a great number of privateers; and when peace was declared it was found that 500 of its citizens were held in England as prisoners of war. In the civil war it was the first town to send troops to Boston (April 16, 1861), and furnished altogether 1,440 men.

MARBLES, Playing, little balls of marble, baked clay, agate, or other stony substance, used as toys for children. Marbles are made in immense quantities in Saxony for exportation to the United States, and to India and China. They are also largely manufactured in the agate mills at Oberstein on the Nahe, in Germany, particularly for the American market. The material used in Saxony is a hard calcareous stone, which is first broken up into square blocks with a hammer. These are then thrown 100 to 150 together into a mill, which is constructed of a stationary flat slab of stone, with a number of concentric furrows upon its face. Over this a block of oak of the same diameter, partially resting upon the small stones, is kept revolving, while water flows upon the stone slab. In 15 minutes the marbles are worn completely round, and are fit for sale. An establishment with three mills will manufacture 60,000 marbles in a week. Agates are made into marbles at Oberstein by first chipping the pieces nearly round with a hammer, and then

wearing them down upon the face of large grindstones. The hard stones are managed with great dexterity by the workmen, who in a few minutes bring them into the shape of perfect spheres.

MARBOIS, Barbé. See BARBÉ-MARBOIS.

MARBURG, a town of Prussia, in the province of Hesse-Nassau, on the river Lahn, 49 m. S. W. of Cassel; pop. in 1871, 9,065. The principal public buildings are the church of St. Elizabeth, a fine, perfectly preserved specimen of the pointed Gothic, built in the 13th century, and the ancient castle of the landgraves of Hesse on the Schlossberg (now used as a penitentiary), where the famous discussion on transubstantiation between Luther and Zwingli took place, Oct. 1-3, 1529. The university of Marburg was the first founded in Germany after the reformation, by the landgrave Philip the Magnanimous (May 30, 1527); it was richly endowed from the proceeds of the confiscated

educational institutions, a society for natural history, and a Bible society. The chief manufacture is pottery. The town was several times besieged during the seven years' war. In 1806 and 1809 it was the scene of risings of the Hessian peasantry against the French, who destroyed in 1810 and 1811 the greatest part of the fortifications of the castle.

MARC' ANTONIO. See RAIMONDI.

MARCEAU, François Séverin des Graviers, a French soldier, born in Chartres, March 1, 1769, died at Altenkirchen, Rhenish Prussia, Sept. 23, 1796. His father, a lawyer, intended him for the legal profession; but he enlisted in 1785, and was sergeant in 1789, when he was prominent in the taking of the Bastille. In 1792 he was assigned to the army of the Ardennes, where as commander of volunteers he restored obedience to the commanding general Lafayette. Rapidly promoted for bravery, he was made general of division in 1793, and distinguished himself with

Kléber in the war of the Vendée, especially at the battle of Savenay. His magnanimity in saving the life of Angélique de Melliers, a female royalist combatant, was misrepresented as an act of treason, but he was acquitted. In 1794 he mainly decided the victory at Fleurus (June 26), which placed Belgium at the mercy of France. The committee of public safety called him "the lion of the army," and immediately placed him in charge of the right wing of the army of the Sambre and Oise,



Marburg.

property of the clergy, and attracted students from all parts of Protestant Europe. Although a rival university was established in Giessen in 1607, it continued to flourish until the outbreak of the thirty years' war. From 1625 to 1650 the Giessen university was united with that of Marburg, but they have since been again separated, the former being now the national university of Hesse-Darmstadt. In the first part of the 18th century Marburg derived great celebrity from the philosopher Christian von Wolf, who was one of the professors. In the winter of 1873-'4 the university was attended by 433 students, mostly medical. It contains a library of about 180,000 volumes, an anatomical theatre, an observatory, an admirable chemical laboratory, a botanic garden, a lying-in asylum, a clinique, a school for veterinary surgeons, a zoological museum, a philosophical seminary, and one for political sciences. Marburg possesses also a gymnasium and other

Jourdan being commander-in-chief, and Kléber at the head of a division. In October he achieved a brilliant success in capturing Coblenz, the great focus of the emigrant nobles. In 1795 he took part in the siege of Ehrenbreitstein. While commanding the rear guard on the right bank of the Rhine, he was driven to despair by the premature destruction of a pontoon on the Sieg, and would have committed suicide if it had not been for the intervention of one of his aides-de-camp. Kléber arrived in time to rescue him from his perilous position. In 1796 he was placed at the head of the first division to cover the retreat of Pichegru from Mentz, and to protect the operations of Jourdan, whom he enabled to effect a junction with Kléber. At the end of July he took Königstein, after having baffled an attempt of the enemy to make a sortie from Mentz, which place he invested, and gained several other important successes. While occur-

pying the plain of Altenkirchen, awaiting the arrival of Jourdan, he undertook a reconnaissance, Sept. 20. He was severely wounded by a ball, and was carried within the enemy's lines, where he died three days after. His obsequies were celebrated with great pomp, the Austrians firing minute guns in his honor. A pyramid erected near the spot where he fell was subsequently removed to the neighborhood of Coblenz. In his native town monuments were erected in his honor; and in September, 1851, a bronze statue of him was placed in the principal square.—See *K'ther et Marceau*, by Charles Desprez (Paris, 1857).

MARCELLO, Benedetto, an Italian composer, born in Venice, July 24, 1686, died in Brescia, July 17, 1739. His father was a Venetian senator, and personally superintended his education. He studied music thoroughly, learning counterpoint under Gaspari, became an advocate, and held several important offices, being a member of the council of forty and treasurer at Brescia. His most esteemed work is his music for Giustiniani's version of 50 of the Psalms. The pieces were written for two, three, and four voices, with accompaniment for organ or clavichord, several having also *obbligato* for violoncello or two violas. John Garth of Durham published a fine edition of these psalms in eight folio volumes, with English words. Marcello's other works consist of oratorios, masses, cantatas, madrigals, and different parts of the Roman Catholic service. He wrote also what he styled a "Drama for Music," and *Calisto in Orsa*, a pastoral with the use of scenery; a variety of instrumental compositions, and two satirical madrigals. Besides these musical works, he left a treatise in manuscript on music, a poem upon the redemption, and a collection of sonnets, verses, burlesque poems, and dramas. He is justly considered as one of the greatest of the Italian masters; his style being noble and sustained, his invention poetic, and his thought and musical forms full of originality.

MARCELLUS, Marcus Claudius, a Roman general, born about 268 B. C., killed near Venusia, in Apulia, in 208. The family to which he belonged (a plebeian branch of the great Claudian *gens*) was of the highest distinction in Rome. Marcellus was early known as a bold and skilful soldier, serving in the first Punic war. His first office was that of curule ædile, to which he was chosen about 226. Shortly afterward he was elected augur, and in 222 he was made consul. While holding that office he brought the Gallic war to a successful termination, killing the leader of the Gauls with his own hands. Marcellus dedicated the spoils of the Gallic chief as *spolia optima* in the temple of Jupiter Feretrius, being the third and last instance of such dedication in Roman history. He was one of the prætors in 216, when the second Punic war was at its height, and was about to sail for Sicily when the defeat of the Romans at Cannæ caused a change in his

destination. Employed against Hannibal, he prevented the town of Nola from falling into his hands, and repulsed his forces, which was the first check received by the Carthaginian. He was summoned to Rome to take part in the consultations concerning the conduct of the war, and then sent back to Campania as proconsul. Elected consul in 215, with another plebeian for colleague, he resigned the office rather than offend the senate, which was averse to the whole consular power being in plebeian hands. Returning to his proconsular position in Campania, he again baffled Hannibal at Nola, and inflicted great loss on his army. He was elected consul in 214, having Fabius Maximus for his colleague, and resumed his Campanian command, repulsing Hannibal at Nola for the third time. Casilinum having capitulated to Fabius, Marcellus massacred all the garrison but 50. He was then sent to Sicily, which he nearly conquered in three years. The siege of Syracuse, which he maintained for two years, and in which he was opposed by the science of Archimedes, who was killed during the sack of the town (212), was one of the most famous sieges of ancient warfare. Returning to Rome in 211, he was refused the honors of a triumph because he had not entirely subdued Sicily. His ovation was very brilliant, but the magnificence of his Sicilian spoils, comprising rich works of art, gave much offence to the old Roman party. He was a fourth time consul in 210. Prevented from returning to Sicily by the opposition of the Sicilians, whom his cruelty and rapacity had alienated, he was placed at the head of the army which acted against Hannibal that year, and the next year retained the command of it as proconsul. The Romans complained of his want of vigor during the latter part of his proconsulate, but he defended himself successfully, and was elected consul for the fifth time. Having appeased the Arretians, who threatened revolt, he again assumed command of the army in presence of Hannibal, his colleague being with him. While reconnoitring the Carthaginian camp, he fell into an ambuscade, and was slain.

MARCELLUS, Nonius, an early Latin grammarian, in regard to whose personal history there is no authentic information, but who is known as the author of *Nonii Marcelli Peripatetici Tuberticensis de Compendiosa Doctrina per Litteras ad Filium*, first published in Rome about 1470. The first critical editions appeared in 1565 and 1586. Mercier's Paris edition of 1614, with a new version of the text, was republished in Leipsic in 1826. In 1842 appeared a superior edition by Gerlach and Roth, and in 1872 the best of all by the French grammarian Louis Marie Quicherat.

MARCH (Lat. *Martius*, pertaining to Mars), the third month of the year, consisting of 31 days. It was the first month in the early Roman calendar, and it also marked the commencement of the year among some of the Latin Christian nations till the 18th century. The English

legal year began March 25 until the change of style in 1752. There is an old English and Scottish proverb: "March borrows three days of April, and they are ill."

The first, it shall be wind and wet;
The next, it shall be snaw and sleet;
The third, it shall be sic a freeze,
Sall gar the birds stick to the trees.

It is disputed whether these "borrowing days" were the last three in March or the first three in April. Dr. Jamieson explains that when they were stormy March was said to borrow them from April that he might extend his power so much longer.

MARCH, or **Morava**, a river of Austria, which rises on the N. frontier of Moravia, near Alstadt, and flows S. S. E., passing Olmütz, Krenier, and Hradisch; then turning S. S. W. it separates Hungary from Moravia and the archduchy of Austria, and flows into the Danube 7 m. above Presburg. Its principal affluents are the Hanna, Miava, Beczwa, and Thaya. Its length is about 200 m., and it is navigable as far as Göding, 50 m., and improvements for extending navigation to Olmütz are proposed. At its mouth it is 400 yards wide. Its position on the boundary of Hungary and proximity to Vienna have made it often of historical importance. The extensive plain between the lower March and the Danube, called the Marchfeld, has been the scene of several great battles, including those of Aspern, Essling, and Wagram.

MARCH, **Charles W.**, an American author, born in Portsmouth, N. H., Dec. 15, 1815, died in Alexandria, Egypt, Jan. 24, 1864. He graduated at Harvard college in 1837, studied law, practised in Portsmouth, and was a member of the state legislature. Removing to New York, he became a writer for the "Tribune" and the "Times," and correspondent of the Boston "Courier." He was for some time vice consul at Cairo. He published "Daniel Webster and his Contemporaries, or Reminiscences of Congress" (New York, 1850), and "Sketches and Adventures in Madeira, Portugal, and the Andalusias of Spain" (1856).

MARCH, **Earl of**. See MORTIMER, ROGER.

MARCH, **Francis Andrew**, an American scholar, born at Millbury, Mass., Oct. 25, 1825. He graduated at Amherst college in 1845, where he was tutor from 1847 to 1849. He studied law in New York, and was admitted to the bar in 1850. After teaching at Fredericksburg, Va., from 1852 to 1855, he was appointed tutor in Lafayette college, at Easton, Pa., in 1856 adjunct professor, and in 1858 professor of the English language and comparative philology. He received the degree of LL. D. from the college of New Jersey in 1870, and from Amherst college in 1871; and in 1873 he was elected president of the American philological association. He has contributed articles on philological subjects to the "Transactions" of that body and of the national educational association, and to the *Jahrbuch für romanische und englische Literatur* in Berlin; and arti-

cles on jurisprudence and psychology, including discussions of Sir William Hamilton's theory of perception and his philosophy of the conditioned, to the "Princeton Review" (1860; reprinted in England, 1861). He has published "A Method of Philological Study of the English Language" (New York, 1865); "Parser and Analyzer for Beginners" (1869); "Anglo-Saxon Grammar" (1870); and "An Introduction to Anglo-Saxon: Grammar, Reader," &c. (1871). He is now (1875) editing a series of text books for college use of the Greek and Latin Christian authors, of which "Latin Hymns" and "Eusebius" have appeared.

MARCHE, **La**, or **La Marche Limousine**, an ancient province of France, bounded N. by Berry and Bourbonnais, E. by Auvergne, S. by Limousin, and W. by Angoumois and Poitou. It now forms the department of Creuse, a considerable portion of Haute-Vienne, and fractions of several other departments. It was divided into Haute- and Basse-Marche, with Guéret as capital of the former and Bellac of the latter. Under the Romans it was part of Aquitania Prima. William III., duke of Aquitaine, converted La Marche into a county in the 10th century. In 1177 it was sold to England, but Hugh IX. de Lusignan, of a family several of whose members became kings of Jerusalem and Cyprus, gained possession of the county, and it belonged to that house until early in the 14th century, when the last descendant of this branch of the Lusignans ceded it to Philip the Fair, king of France. Subsequently it passed through various hands. The most distinguished of the counts of La Marche was Bernard d'Armagnac (died in 1462); his son Jacques d'Armagnac was sentenced to death in 1477 by Louis XI., who confiscated the county for the benefit of his son-in-law Pierre de Bourbon; and after undergoing some more changes, it was permanently united to the crown toward the middle of the 16th century.

MARCHES, **The**, a geographical division of the kingdom of Italy, embracing the provinces of Ancona, Ascoli Piceno, Macerata, and Pesaro ed Urbino; area, 3,746 sq. m.; pop. in 1872, 915,419. The boundaries in general correspond to those of the mediæval marches of Ancona and Fermo.

MARCHESE, **Pompeo**, an Italian sculptor, born in 1790, died in Milan, Feb. 6, 1858. His earlier works were executed under the direction of Canova, and he became professor in the academy of fine arts, ranking among the foremost of modern Italian sculptors. Among his principal works are statues of the Venus Urania, of St. Ambrose, Charles Emanuel, Volta, Beccaria, Bellini, and of Goethe in the public library at Frankfurt; of the emperor Francis, and of Philibert Amadeus of Savoy; a monument to Malibran; and 12 busts in terra cotta of warriors, which he executed gratuitously for the embellishment of the fort of Milan. His colossal marble group, the "Mater

Dolorosa with the Dead Christ on her Lap," known as "The Good Mother," or "The Celebration of Good Friday," is considered to be his masterpiece; this was presented by the emperor Francis to the city of Milan, and placed in the church of San Carlo.

MARCHISIO, Carlotta, an Italian vocalist, born in Turin in 1835, died in 1872. She inherited the musical talents of several members of her family, and thoroughly studied harmony, counterpoint, and other departments of the art. Her magnificent soprano voice secured her success on her first performance in Venice in 1858. Her surviving sister, **BARBARA** (born in 1838), who has a fine contralto voice, appeared on the same occasion, and the two sisters performed together in Italy, France, and almost all over Europe. Rossini composed for them his *Petite messe*, which they executed for the first time in 1865. They were much admired in Paris in *Sémiramis*, and Barbara won great applause as Azucena in *Il trovatore*.

MARCION. See **Gnostics**, vol. viii., pp. 53, 54.

MARCOMANNI (Ger., men of the marches or borders), an ancient German people of Suevic race. They appear to have originally dwelt in the regions of the Main and Neckar in S. W. Germany, whence they followed Ariovistus across the Rhine on his invasion of Gaul, and afterward their own chief Maroboduus into the land of the Boii, which embraced parts of modern Bohemia and Bavaria. Having subdued that people, they established a powerful kingdom N. of the Danube, which soon became involved in wars with the Cherusci, and afterward with the Romans. Their longest and bloodiest war was that waged in alliance with the Quadi, Hermunduri, Narisci, and other German tribes, against the emperor Marcus Aurelius. The latter having died (180) in Vindobona (Vienna) on his last expedition against them, his son and successor Commodus hastened to conclude by purchase a shameful peace with the barbarians. In the 3d and 4th centuries the Marcomanni made some new incursions into the Danubian provinces of the Romans, but during the following great migration of northern nations they finally disappeared from history.

MARCO POLO. See **POLO**.

MARCOU, Jules, a French geologist, born at Salins, in the department of Jura, April 20, 1824. He completed his studies at the collège St. Louis in Paris, and published in 1846, in the memoirs of the geological society, his *Recherches géologiques sur le Jura salinois*. In the same year he was attached to the mineralogical department of the Sorbonne. In 1847 he was employed in classifying the palaeontological collection at the museum, for which institution he made geological investigations in various parts of Europe, and from 1848 to 1850 in the United States and Canada. In 1853-'4 he explored the Rocky mountains, under the auspices of the American government; and he continued his American explora-

tions in 1860, after having in the interval filled the chair of palaeontological geology at the polytechnic school in Zürich. His principal works are: "Geological Map of the United States" (English, 1853), followed in 1855 by a résumé of the same, including Canada; *Le terrain carbonifère dans l'Amérique du Nord*; *Sur le gisement de l'or en Californie*; *Lettres sur les rochers du Jura et leur distribution géographique dans les deux hémisphères* (1857-'60); "Geology of North America" (1858); *Drias et trias, ou le nouveau grès rouge en Europe, dans l'Amérique du Nord et dans l'Inde* (1859); *Carte géologique de la terre*, according to the Jura strata (1862); and *Derniers travaux sur le drias et le trias en Russie* (1870).

MARCUS AURELIUS. See **ANTONINUS**.

MARCY, William Learned, an American statesman, born at Southbridge, Mass., Dec. 12, 1786, died at Ballston Spa, N. Y., July 4, 1857. He was the son of a farmer, graduated at Brown university in 1808, and studied law in Troy, N. Y., where he was admitted to practice. When the war with England broke out in 1812, he was a lieutenant in a military company belonging to Troy, and was stationed at French Mills, now Fort Covington. On the night of Oct. 22, 1812, he was sent with a detachment under command of Major Young to capture a party of Canadian militia posted at St. Regis. Lieut. Marcy led the attack, broke open the door of the blockhouse occupied by the Canadians, and when they surrendered received their arms. These were the first prisoners taken by the Americans on land, and their flag the first standard captured in the war. He remained in service till the close of hostilities. From 1816 to 1818 he was recorder of Troy. He then became editor of the Troy "Budget," a daily newspaper, which he soon made a leading organ of the democratic party. In January, 1821, he was appointed adjutant general of the state militia; and in February, 1823, he was elected by the legislature comptroller of the state, when he removed to Albany. In 1829 he was appointed an associate justice of the New York supreme court, which office he held till Feb. 1, 1831, when he was elected United States senator. During his term he was chairman of the committee on the judiciary. In 1832 he was elected governor of New York, and resigned his senatorship. He was re-elected in 1834, and again in 1836, but was defeated by Mr. Seward in the election of 1838. He was appointed by President Van Buren one of the commissioners to decide upon the claims of the Mexican government under the convention of April, 1839, and performed the duties of this office till 1842. In 1845 President Polk appointed him secretary of war, a post whose duties were made peculiarly difficult and responsible by the breaking out of the war with Mexico in the spring of 1846. As a member of President Polk's cabinet his diplomatic powers were exerted to advantage in the settlement of the Oregon boundary dispute with England,

and his abilities as a statesman were called into requisition upon many other questions. In March, 1853, he was appointed by President Pierce secretary of state, and in the latter part of that year he greatly distinguished himself at home and abroad by his correspondence with the Austrian government on the subject of the release of Martin Koszta by Capt. Ingraham of the United States navy. (See INGRAHAM, DUNCAN NATHANIEL.) Besides his Koszta letter, his state papers on Central American affairs, on the enlistment question, on the Danish Sound dues, and on many other topics of national interest, exhibited his remarkable ability as a writer, statesman, and diplomatist. He retired from office on the inauguration of Mr. Buchanan, March 4, 1857, and just four months later died suddenly while lying on his bed reading. He left a reputation among his countrymen of all parties as a statesman of the highest order of abilities.

MARDIN, a town of Asiatic Turkey, in the vilayet of Diarbekir, 350 m. N. W. of Bagdad; pop. about 12,000. It is situated on a rocky eminence, more than 2,000 ft. above the level of the sea. Near it is a Jacobite monastery, said to have a large library, containing works in 12 different languages. The town is the seat of a United Syrian and Chaldean bishop, and of a flourishing Protestant mission. It has several mosques and churches, and manufacturing of linen, cotton, and leather.

MARDONIUS. See GREECE, vol. viii., pp. 189, 190.

MAREMME (sing. *maremma*, a salt marsh), tracts of marshy country in some parts of middle Italy, on the Mediterranean coasts, especially from the mouth of the Cecina to Orbetello, which are extremely unhealthy from midsummer to the middle of autumn. During this period it is dangerous to spend even a single night in the Maremma; those who do so are almost surely attacked by fever. There is nothing apparent in the air, either to sight or smell, to account for this insalubrity; on the contrary, the atmosphere seems to be remarkably clear and pure. The malaria does not proceed from the water of the marshes, for it is equally virulent on dry elevations, and has been attributed to unhealthy exhalations of sulphur and alum in the soil. In ancient times the Campagna di Roma, which is now almost deserted in consequence of the malaria, was cultivated like a garden, and was the seat of a dense population. The city of Rome itself has been invaded by the mephitic air, and the malarious fever prevails in some of the streets. The Maremma, in different basins, occupy altogether an area of nearly 1,000 sq. m. Of late years efforts, which to some extent have been successful, have been made to redeem the marshes by drainage, banking in the lakes, planting trees, and bringing the ground into tillage.

MARENCO, Carlo, an Italian dramatist, born at Cassolo, Piedmont, May 1, 1800, died in Savona, Sept. 20, 1843. He took his degree in

jurisprudence at Turin in 1818, but became famous in 1828 by his drama, *Bondelmonte*. His *Famiglia Foscari* is especially admired. He spent most of his life at Ceva, excepting shortly before his death, when the government appointed him to a public office at Savona. His posthumous *Tragedie inedite*, edited by G. Prati (Florence, 1856), contain several poems.

MARENGO, a W. county of Alabama, bounded W. by the Tombigbee river, which unites with the Black Warrior on the N. W.; area, 975 sq. m.; pop. in 1870, 26,151, of whom 20,058 were colored. It has a nearly level surface; the soil is very fertile, and a tract known as the "Canebrake" is among the most productive cotton land in the south. The chief productions in 1870 were 598,938 bushels of Indian corn, 38,691 of sweet potatoes, 164,931 lbs. of butter, and 23,614 bales of cotton. There were 1,377 horses, 3,629 mules and asses, 4,116 milch cows, 8,315 other cattle, 1,763 sheep, and 16,531 swine. Capital, Linden.

MARENGO, a village of Piedmont, Italy, on the river Bormida, 2 m. S. E. of Alessandria, situated on an extensive plain of the same name, where a victory was gained by Bonaparte over the Austrian general Melas, June 14, 1800. Bonaparte, having crossed the Great St. Bernard in the latter part of May and overrun a large portion of Lombardy, entered the plain of Marengo with the object of preventing Melas, who had concentrated his forces at Alessandria, from escaping him by a march southward to Genoa. On the morning of June 14 the village of Marengo was occupied by two French divisions under Victor. Melas attacked them with 31,000 men and 200 cannon, and at 11 o'clock, when Bonaparte arrived, Victor's divisions with Lannes's corps were in full retreat. The fugitives, reanimated by the presence of Bonaparte, rallied and kept the Austrians in check. At 4 P. M. Desaix's corps, which was on the road to Novi, and had been hurriedly recalled, arrived on the field and took position on the left, while Victor and Lannes reformed on the right, with Marmont's masked battery in the rear. Thus reinforced, Bonaparte turned the tide and completely overwhelmed the Austrians, the younger Kellermann's cavalry charge deciding the day. The Austrians lost 7,000 killed and wounded, 3,000 prisoners, 20 pieces of artillery, and 8 standards. The French, who brought about 28,000 men into the field, lost about 7,000 in killed (including Desaix) and wounded and 1,000 prisoners. An armistice followed, by the terms of which the Austrians were allowed to retire beyond the Mincio on condition of giving up all their fortified places in Italy west of that river.

MARENZIO, Luca, an Italian composer, born near Brescia about 1550, died Aug. 22, 1599. His parents were poor, and he received instruction from the parish priest and the chapel-master at Brescia. His first collection of madrigals brought him into notice, and he was engaged in the service of the king of Poland.

The climate of the north being too severe for him, he returned to Italy and entered the service of Cardinal d'Este, and later of Cardinal Aldobrandini as chapelmaster. In 1595 he was admitted to the college of preceptors of the pontifical chapel. He is considered as one of the greatest composers of the 16th century, and was surnamed *il più dolce cigno*, "the sweet swan," and "the divine composer." He gave himself almost wholly to the composition of madrigals for four, five, and six voices; but in these, of which he wrote a great number, he displayed an invention, grace, and skill that won for him universal admiration.

MAREOTIS (Arab. *Birket el-Maryoot*), a lake in Lower Egypt, S. E. of Alexandria, whose southern walls it once washed; length nearly 40 m., breadth 15 m., depth from 4 to 14 ft. It is separated from the Mediterranean on the west by the narrow neck of land on which Alexandria is situated. In former times its connection by canal with the Rosetta branch of the Nile, and with the sea at Port Eunostu, the old harbor of Alexandria, made it available for inland navigation, and its shores were covered with vineyards and gardens. With the decay of Alexandria the canal was neglected, and the lake, ceasing to receive the Nile waters, gradually dried up. In 1801 the British, then besieging the French in Alexandria, cut the narrow isthmus separating the lakes of Mareotis and Aboukir, and the sea water flowing in filled the bed of the lake. Mehmet Ali reestablished the isthmus by filling up the channel cut by the British, and restored the canal connecting with the Rosetta branch of the Nile at Fua.

MARESCI, J. A., a Russian horn player, born in Bohemia in 1709, died in St. Petersburg in 1794. In 1744 he entered the Russian imperial service, where his talent was noticed by Prince Narishkin, under whose direction he set about the improvement of the Russian horns. The instruments of this class then in use were very inferior in construction, giving but one tone. He made 37 of these, giving all the tones and semi-tones comprised within three octaves. The horn producing the lowest tone was 7 ft. in length, that producing the highest, one foot. He distributed these 37 horns to as many men, and by severe drilling enabled them to execute the most difficult and rapid passages. Each performer waited for the proper instant for him to sound his particular note with the necessary degree of force. The first trial of this singular music was made in 1755 in presence of the imperial court at Ismailov, near Moscow. Maresch was munificently recompensed for the astonishing results which he obtained.

MARET, Henri Louis Charles, a French theologian, born at Meyrueis, Lozère, April 20, 1805. He was ordained in 1830, appointed to a charge in Paris in 1832, and in 1839 published *Essai sur le panthéisme dans les sociétés modernes*, which brought him prominently before the public. In 1840 he was appointed professor

of dogmatic theology in the Sorbonne, and honorary canon of Notre Dame. In 1844 he published the result of his lectures at the Sorbonne under the title of *Théodicée chrétienne*, which was a parallel between the Christian and the rationalistic notion of God. In 1849 he was appointed vicar general of Paris, and in 1853 dean of the faculty of theology. His *Philosophie et religion* (1856) has been translated into several languages. He was in 1860 nominated by the government bishop of Vannes, but on account of his Gallican opinions he was not confirmed by the pope; and in 1861 he was consecrated bishop of Sura in *partibus infidelium*, and appointed by the emperor a member of the imperial chapter of St. Denis. In 1869, before the opening of the Vatican council, he published *Du concile général et de la paix religieuse* (2 vols. 8vo), which was translated into German and Italian. This work was assailed by the *Univers*, as well as by Archbishop Manning, to whose arguments Bishop Maret replied in *Le pape et les évêques*. At the council he voted with the opposition; but in September, 1871, he wrote to the pope to express his acceptance of the decree of infallibility, and his regret for everything which he had written against it. His other principal works are: *L'Eglise et la société laïque* (1845), and *L'Anti-christianisme* (1864). When Lacordaire in 1848 founded *L'Ère Nouvelle*, he placed it under the direction of M. Maret.

MARET, Hugues Bernard. See BASSANO.

MAREY, Etienne Jules, a French physiologist, born in Beaune in 1830. He took his medical degree in Paris in 1860, subsequently lectured on the circulation of the blood, and in 1867 succeeded Florens as adjunct professor of natural history at the collège de France. His principal works are: *Tableau sommaire des appareils et expériences cardiographiques de M.M. Chauveau et Marey* (Paris, 1863), and *Du mouvement dans les fonctions de la vie* (1867). His experimental researches on the movements of animals are also of great originality and excellence. His latest book is *La machine animale: Locomotion terrestre et aérienne* (Paris, 1873), of which the English translation ("Animal Mechanism, a Treatise on Terrestrial and Aërial Locomotion," New York, 1874) forms vol. xi. of the "International Scientific Series."

MAREZOLL, Gustav Ludwig Theodor, a German jurist, born in Göttingen, Feb. 13, 1794, died in Leipzig, Feb. 25, 1873. He was a son of Johann Gottlob Marezoll (1761-1828), an eloquent Protestant clergyman, whose writings, especially his *Andachtsbuch für das weibliche Geschlecht* (2 vols., Leipzig, 1788-'9), had many editions and translations. He studied in Jena and Göttingen, where he took his degree in 1815; and was professor at Giessen from 1817 to 1837, and subsequently at Leipzig till 1864, when he retired. His principal works are: *Lehrbuch der Institutionen des römischen Rechts* (Leipzig, 1839; 9th ed., 1869), and *Das gemeine deutsche Criminalrecht* (1841; 3d ed., 1856).

MARGARET, titular queen of Navarre, or **MARGARET OF ANGOULÊME**, born in Angoulême, April 11, 1492, died at the château of Odos, in Bigorre, Dec. 21, 1549. She was the daughter and eldest child of Charles of Orleans, count of Angoulême, and of Louise of Savoy. Her father died when she was in her 12th year, and she was educated by her mother at the court of Louis XII. She was married in 1509 to Charles, duke of Alençon, a prince of the blood royal, and the five years immediately following were passed in the duchy of Alençon; but on the accession of her brother to the throne of France as Francis I. (1515), she became attached to his court, and had a large part in the government. She was superior to her brother in ability, spoke several languages fluently, and her learning and wit made her the fit companion of the statesmen of those times. After the defeat and capture of her brother at Pavia, in February, 1525, Margaret aided her mother to carry on the government for some months; but in August she went to Madrid, where Francis was then a prisoner. During this visit she was efficient in negotiating the treaty of January, 1526, which eventually led in 1530 to the marriage between Francis and Eleanor, sister of the emperor, and queen dowager of Portugal. The duke of Alençon, her husband, died in 1525, and in January, 1527, she became the wife of Henri d'Albret, count of Béarn and titular king of Navarre, whose kingdom was held by Spain. Francis, besides bestowing a liberal portion on Margaret, pledged himself to effect the restoration of her husband to the throne of Navarre, for which Margaret, as her correspondence shows, was anxious; but circumstances baffled his purpose. In 1529 she and her husband retired to the principality of Béarn, where they labored with success for the improvement of the country. Margaret also paid much attention to the government of her duchy of Alençon. She sympathized with the reformers, several of whose leaders, and especially Calvin, were protected by her in Béarn against their persecutors. How far she favored the new doctrines is unknown, and it has been asserted by adherents of the old faith that she admitted, some time before her death, that she had been in error, and when dying declared that what she had done for the reformers was more from compassion for them than from ill will to Rome. It is certain, however, that the zealous Catholics regarded her as a heretic, and that one of her works, *Le miroir de l'âme pécheresse* (1533), contains Protestant doctrines. The Sorbonne censured it, and it was denounced in other ways. Francis was told that if he wished to destroy the heretics, he must begin with the queen his sister; but he never would allow her to be injured, and punished some of those by whom she had been insulted, or who had sought to poison his mind against her. Margaret was a voluminous writer in verse and

prose, and one of her works, the *Heptaméron*, is an old French classic. It was published in Paris in 1559 (best ed., 1863), and has been translated into English by W. K. Kelly (London, 1855). It is written in imitation of the *Decamerone* of Boccaccio, but was left incomplete at her death, as it contains but 72 tales, instead of 100 as originally intended. It is so far an original work, that most of the adventures described befell some of the author's contemporaries. She wrote many poems, dramas, poetical epistles, rondeaux, and the like, several of which have been printed, while others remain in manuscript. Her letters to her brother Francis were published in Paris, from the originals, in 1842. On the death of Francis I. (1547) Margaret, who was much afflicted by his loss, became devout, passed most of her time in seclusion, and solaced her mind with religious thoughts and literary pursuits. Her daughter, Jeanne d'Albret, who married Antoine de Bourbon, became the mother of Henry of Navarre, afterward Henry IV. of France, and founder of the royalty of the house of Bourbon. The best life of Margaret of Navarre is that by Martha Walker Freer (2 vols., London, 1854).

MARGARET, queen and patron saint of Scotland, born in Hungary in 1046, died in Edinburgh, Nov. 17, 1093. She was the niece of Edward the Confessor, and daughter of Edward, son of Edmund Ironside, and of Agatha, daughter of the emperor Henry III. With her brother Edgar Atheling and her sister Christina she was reared at the court of Hungary till 1056, when she returned to England. She fled to Scotland in 1070 with Edgar, and was received at Dunfermline by King Malcolm Canmore, whose wife she became soon afterward. Margaret was gentle, pious, learned, and accomplished, and anxious to introduce among the people of Scotland a higher civilization. She enlightened her husband's mind and soothed his fierce spirit; invited the Scottish clergy and monks to a council, in which she prevailed on them to adopt the Roman manner of celebrating Easter; and put into practice several wise regulations for the instruction of their flocks. She also prevailed on the king to encourage commercial intercourse with other countries. She regulated the royal household, introducing the ceremonial of European courts. She was lavish in her charities to the poor, and founded a number of churches, working with her own hands for their embellishment. She bestowed her chief care on the education of her nine children, especially her six sons; the youngest, David I., was called by Buchanan "the perfect exemplar of a good king," and his sister, Queen Matilda or Maud, who founded London bridge, inherited all their mother's virtues. King Malcolm and Edward, his eldest son, having been slain before the walls of Alnwick, Nov. 13, 1093, the news of their death so affected the queen that she died four days afterward (though according to

some she lingered till June 10, 1094). She was canonized in 1251 by Innocent IV.; and Clement X. in 1673 made her the patron saint of Scotland. Her feast is celebrated on June 10. St. Margaret's chapel, built in her honor by David I., is still visited in the castle of Edinburgh. It was restored in 1853, and in the chancel are three stained-glass windows with portraits of the saint, Malcolm Canmore, and David I. The life of St. Margaret was written in Latin by her chaplain and confessor, Theodoric or Thierry, a monk of Durham; in French by Lefebvre (Douai, 1660); and by the Bollandists in *Acta Sanctorum*.—"St. Margaret's cup" or "draught" was a custom introduced by her into the Scottish court for the purpose of repressing drunkenness, and consisted in her filling with her own hand a cup of choice wine, of which all partook, with the promise to drink no more. After this grace was said. This custom became general in Great Britain, Flanders, and Germany, several popes attaching an indulgence to the "grace cup" on condition that it should be the last for that day. This was especially observed by guilds and brotherhoods at their yearly banquets, and many of these indulgenced cups, called "mazers," are still preserved.

MARGARET OF ANJOU, queen of England, daughter of René, duke of Lorraine and count of Provence, and titular king of Sicily and Jerusalem, and of Isabella of Lorraine, born at Pont-à-Mousson, March 23, 1429, died at the château of Dampierre, Aug. 25, 1481. Her childhood was passed, amid the troubles that befell her family, in Italy, France, and Lorraine. Her hand was sought by the count de St. Pol and by the count de Nevers. Report of her beauty having reached Henry VI. of England, from a gentleman of Anjou, who acted under the inspiration of Cardinal Beaufort, her portrait was obtained for his inspection. This decided the king's action, and commissioners were appointed to negotiate a truce with France and Burgundy. Charles VII. favored the marriage, with the view of making it the basis of peace. Not only was no dowry asked with Margaret, but England ceded Anjou and Maine to René, who claimed them as his hereditary dominions. The war party in England, headed by the duke of Gloucester, opposed both the peace and the marriage, but the Beaufort party proved victorious; and Suffolk, who was elevated to a marquise, married Margaret as Henry's proxy at Nancy in November, 1444. Margaret did not reach England until the next April, when her marriage took place in Titchfield abbey. In 1447 occurred the death of the duke of Gloucester, of which she has been accused by some historians. She soon became unpopular, and the English connected the loss of their French possessions with her marriage. The York family, taking advantage of the weakness of the king, aimed to obtain the crown, which belonged to their chief by the law of descent.

Margaret's only child, Edward, born Oct. 13, 1453, was said by her enemies to be either the offspring of adultery or a supposititious child. Prince Edward was born while his father was suffering from one of his fits of imbecility, and when the queen was at the head of the government. The duke of York was made protector, but on the restoration of the king's health he was dismissed, whereupon he asserted his right by an appeal to arms, and the Yorkists won the first battle of St. Albans, which restored them to power. Parliament censured the queen and her friends, but in 1456 Henry assumed his rights, and the government was virtually in Margaret's hands. Personal ill feeling between the queen and the earl of Warwick, the most powerful of the Yorkist leaders, caused a renewal of the war, and the Lancastrians were at first victorious; but the Yorkists rallied, defeated their foes, and obtained possession of the person of the king, who recognized York as his successor. Margaret fled with her son, first to Wales, and thence to Scotland. Receiving assistance from the Scotch, she returned to England, and was joined by her supporters in the northern counties. York advanced to oppose her, and was defeated and slain at Wakefield. Marching to London, she defeated Warwick in the second battle of St. Albans, and released her husband. The Londoners would not admit her into their city, but recognized York's eldest son as king, by the title of Edward IV. She retreated north, and was followed by Edward. After the fatal battle of Towton, March 29, 1461, Margaret fled to Scotland with her husband and son. Thence she went to France, in the hope of obtaining aid from Louis XI., in which she met with little success. Pierre de Brezé, seneschal of Normandy, armed in her support, and by his aid she landed in England, but accomplished nothing, and returned to Scotland. There she raised forces and invaded England, and at first obtained some successes, but was defeated in the battle of Hexham, in 1464. She returned again to Scotland, and afterward went to Flanders. After remaining some time at Bruges, she took up her residence in her father's dominions, where she superintended her son's education, aided by Sir John Fortescue. She visited the French court, at Tours, in 1469; and it was under the mediation of Louis XI. that a reconciliation between her and the earl of Warwick was effected in 1470, the earl having broken with Edward IV. and fled from England. The earl's youngest daughter, Anne Neville, was betrothed to the queen's son, Edward of Lancaster. Warwick returned to England and marched to London; the Lancastrians were for the time triumphant; Edward IV. fled to the continent, and Henry VI. regained the throne. Margaret prepared to return to England, but contrary winds delayed her purpose, and it was not till April 14, 1471, that she landed at Weymouth, accompanied by her son. Warwick, however, had been defeated

and slain on the same day in the battle of Barnet, and the queen took sanctuary in Beaulieu abbey. Some of the Lancastrian leaders, who had a strong force, induced her to join them; and while seeking to effect a junction with their friends in Wales, they were assailed and defeated at Tewkesbury, May 4, 1471, by Edward IV. Margaret fell into the hands of the victor, her son having previously been slain. Her husband was put to death a few weeks later. She was imprisoned in the tower, and afterward at Windsor and at Wallingford, till Nov. 3, 1475, when she was ransomed by Louis XI., who paid 50,000 crowns for her liberty, her father having ceded Provence to him for the purpose. She formally renounced all the rights her English marriage had given her, and resided in deep seclusion at Reculée, near Angers, one of the possessions of her father, seldom leaving that retreat. Her last days were passed in the château of Dampierre, to the lord of which her father at his death had consigned her.—See "Life and Times of Margaret of Anjou," by Mary Ann Hookham (2 vols., London, 1872).

MARGARET OF AUSTRIA, daughter of Maximilian I., emperor of Germany, and of Mary of Burgundy, born in the Low Countries, Jan. 10, 1480, died there, Dec. 1, 1530. Before she was three years old she was, by the treaty of Arras, concluded between her father and Louis XI. of France, affianced to the dauphin, with a large territorial dowry. To prepare her for her future station, she was educated at the French court; but Charles VIII. broke the contract, and returned her to her father, in order that he might wed Anne of Brittany, whom Maximilian himself was seeking in marriage. This gross insult, which happened in 1491, was never forgiven by the house of Austria. In 1495 a treaty of alliance was made between Maximilian and Ferdinand and Isabella, one of the terms of which was that John, prince of the Asturias, and heir apparent of the Spanish sovereigns, should marry Margaret. Sailing for Spain in winter, the weather was so stormy that many of the vessels composing the fleet were wrecked, and that which bore the princess was in great danger of being lost; but she was so cool that she wrote her own epitaph:

"Ci gist Margot, la gentil' damoiselle
Qu'a deux maris, et encore est pucelle."

Landing in Spain in March, 1497, Margaret was married to Prince John on April 3. Their union was of brief endurance, as John died of fever on Oct. 4. In a few months Margaret gave birth to a still-born child, and in 1499 she returned to the Netherlands. In 1501 she married Philibert the Fair, duke of Savoy, who died without issue in 1504. On the death of her brother Philip in 1506, she was made regent of the Netherlands by her father, and superintendent of the education of her nephew, the future emperor Charles V., and his sister Mary. She was an able ruler, and was con-

cerned in some of the principal negotiations of that time, proving herself a vindictive enemy of France, and a zealous servant of the house of Austria. In connection with Louise of Savoy, mother of the king of France, she negotiated the treaty of Cambray, in 1529, between Francis I. and Charles V., which was called the "ladies' peace," the terms of which were most humiliating to the French. Throughout her life she showed a fondness for literary pursuits, and wrote well in prose and verse.

MARGARET OF DENMARK, called the Semiramis of the North, queen of the united kingdoms of Denmark, Sweden, and Norway, born in Copenhagen in 1583, died in Flensburg, Oct. 28, 1412. She was the third daughter of Waldemar III., king of Denmark, and at the age of 10 was married to Haco, king of Norway. Upon the death in 1387 of Olaf, the offspring of this marriage, and the king of Denmark and Norway, she procured her election as queen of the former kingdom, and by skilful management soon after secured the crown of Norway. In 1388 the Swedes, who were oppressed by their king Albert, having offered her the throne of that kingdom, she defeated Albert, who after seven years' imprisonment was released on condition of formally resigning his crown. Thenceforth she reigned with absolute authority. When urged to secure an heir to her throne by another marriage, she promised to designate a successor, and at the assembly of the estates of the three kingdoms at Calmar, in 1397, presented to the deputies her grand-nephew Eric as her appointed heir. On this occasion, by her eloquence and address, she procured the adoption of a fundamental law, called the "Union of Calmar," establishing a perpetual union of the three kingdoms. Eric was at the same time associated with her in the government. Although holding extreme opinions on the royal prerogative, Margaret was in the main a just, magnanimous, and successful sovereign.

MARGARET OF PARMA, regent of the Netherlands under Philip II. of Spain, born in Brussels in 1522, died at Ortona, Italy, in 1586. She was the natural daughter of Charles V. by Margaret van der Geest, a lady of a noble Flemish family in Oudenarde, and received an education suited to her rank in the household of Mary, queen dowager of Hungary. In 1536 she became the wife of Alessandro de' Medici, duke of Florence, a man of profligate habits, and her senior by about 12 years. Within a year of the marriage Alessandro was assassinated by his kinsman, Lorenzino de' Medici, and the young widow, upon reaching the age of 20, was united to Ottavio Farnese, then 18 years old, receiving as her dowry the duchies of Parma and Piacenza. Toward Farnese she entertained feelings of contempt. Her birth, her masculine bearing, her undoubted capacity and training in the astute school of Italian politics, and above all her orthodoxy in matters of religion, suggested

her to Philip, when about to take his departure from the Netherlands in 1559, as a suitable person to fill the office of regent of those provinces. Her administration, which lasted eight years, and witnessed the opening scenes in the great revolt of the Netherlands, was mild and beneficent in comparison with those which followed. She left the Netherlands Dec. 30, 1567, was amply pensioned by Philip, and passed the remainder of her life chiefly in Italy. Her tastes, including her love for the chase, were masculine; and in personal appearance "she seemed," in the language of a contemporary historian, "like a man in petticoats," the illusion being heightened by a somewhat hairy chin and upper lip. She died of gout. Alexander Farnese, the great commander, was her son.

MARGARET OF VALOIS, queen of France, born at St. Germain, May 14, 1553, died in Paris, March 27, 1615. She was the daughter of Henry II. and of Catharine de' Medici, and was famous for beauty, talents, and profligacy. The third duke of Guise, Henri de Lorraine, would have married her, although aware of her vices; but she desired a crown, and agreed to become the wife of Sebastian of Portugal, a union which was prevented by the influence of Spain. In August, 1572, she was married to the king of Navarre, afterward Henry IV. of France. Her mother, just before the massacre of St. Bartholomew, sought her consent to have her marriage with a heretic annulled, but this Margaret refused. There was no attachment between her and her husband, and she hated his religion. A short time after he left Paris in 1576 she was permitted to join him in Béarn, where she remained five years, tolerating his infidelities, though he would not tolerate her religion. In 1581, on the invitation of her mother, she returned to the French court. There the profligacy of her life drew upon her the condemnation of her brother, Henry III., who compelled her to return to her husband, by whom she was received with bitter reproaches. She fled from him, and took up her residence at Agen, whence she made war on him as a heretic. That place being taken in 1585, she vainly sought another asylum, and was seized and imprisoned in the fortress of Usson; but her arts made her mistress of the place, from which she drove the governor, and held it for 20 years. She became queen of France in 1589, on the death of Henry III.; but her husband, even after his triumph in 1594, refused to restore her to freedom until she should renounce her rank, to which she would not consent until after the death of his mistress, Gabrielle d'Estrées. They were divorced in 1599, but she did not recover her liberty until some years later. She visited the court in 1605, where she did homage to her successor, Maria de' Medici. The remaining 10 years of her life were passed in Paris or its vicinity. Almost to her last days she led a

vicious life; but at length she fell into hypochondria, and was terrified at the approach of death. She founded the convent of the Petits Augustins in Paris, and instructed the children of the choir in music. Her *Mémoires* (latest ed., Paris, 1860), written by herself, are valuable because of the details they contain of the last days of the line of Valois.

MARGARINE, and **Margaric Acid**. When olive oil is cooled down to 32° F. and submitted to pressure, a solid residuum is obtained, which, when more completely separated from the oily portion after melting and slowly cooling to the temperature of 55° or 60° by a second pressing, is the substance formerly called margarine. It dissolves in about 400 times its weight of boiling alcohol, and separates in pearly scales as the alcohol cools; whence its name, from Gr. *μαργαρίτης*, a pearl. It is also obtained from human fat, goose grease, and other fatty substances. When saponified it yields an acid in the form of white pearly scales or fine needles, called margaric acid. This, according to Heintz, is a compound of stearic and palmitic acids, into which it may be separated. The term margaric acid is now restricted to an artificially prepared fatty acid having the definite composition $C_{17}H_{33}O_2$. This acid is produced by the action of potash on cyanide of cetyl (margaronitrite). The margarine or margaric acid described by Chevreul in 1820 has been shown to be a compound of stearic acid and other fatty acids of lower melting point.

MARGARITA, *Island of*. See **NUEVA SPARTA**.

MARGARITONE D'AREZZO, an Italian artist, born in Arezzo about 1236 (according to Wornum; about 1215 according to others), died there at the age of 77. He attained great celebrity in Italy before the time of Cimabue. He executed many works in fresco and distemper in the churches and convents of Arezzo, in the Byzantine style, of which few remains are now to be seen. His "San Francesco," however, which Vasari calls one of his masterpieces, still exists, and bears his inscription. He was more celebrated as a sculptor than as a painter, and one of his chief works, a reclining statue of Pope Gregory X., is still preserved at Arezzo.

MARGATE, a seaport town of Kent, England, on the isle of Thanet, 15 m. N. E. of Canterbury, and 63 m. E. by S. of London; pop. in 1871, 12,054. The great source of prosperity is the visitors in summer, who occasionally number, it is said, 100,000.

MARGAY. See **OCELOT**.

MARGRAVE. See **MARQUIS**.

MARHEINEKE, Philipp Konrad, a German theologian, born in Hildesheim, May 1, 1780, died in Berlin, May 31, 1846. He was educated at Göttingen, and in 1806 became professor extraordinary of theology at Erlangen; in 1809 ordinary professor at Heidelberg; and in 1811 ordinary professor at Berlin, and pastor of the church of the Trinity. The first edition of his *Grundlehren der christlichen Dogmatik*, which was founded on the philosophy of Schel-

ling, appeared in 1819. The second revised edition (Berlin, 1827) was adapted to the Hegelian philosophy. His most important historical work is the *Geschichte der deutschen Reformation* (4 vols., Berlin, 1816-'34), which reproduces many documentary records. In his *Christliche Symbolik* (3 vols., Heidelberg, 1810-'14), and his *Institutiones Symbolicae* (3d ed., 1830), he took a historical and comparative rather than dogmatic view of the principal Christian creeds. The practical results of his aim to demonstrate the unity and harmony of the Scriptures, the church, and the reason appear in his *Entwurf der praktischen Theologie* (Berlin, 1837). He published several volumes of minor writings and sermons, was one of the editors of the works of Hegel, and was prominent in the controversies excited by the *Symbolik* of Möhler, and the mystical tendencies of Görres, both of whom he opposed.

MARIA CHRISTINA, former queen dowager of Spain, born in Naples, April 27, 1806. Her father was Francis I., king of the Two Sicilies, and her mother Maria Isabella, daughter of Charles IV. of Spain. She became the fourth wife of Ferdinand VII. of Spain, Dec. 11, 1829, to the consternation of the Carlists, whose hope that the childlessness of the king would secure to his brother Don Carlos the succession to the throne was prostrated by the restoration on March 29, 1830, of the law by which the crown was made heritable by the female line. Maria Christina gave birth to a daughter, afterward Isabella II., on Oct. 10, 1830. In October, 1832, Maria Christina, at the request of the king, took the reins of government into her own hands, and courted popularity by promulgating a general amnesty two weeks afterward. The king resumed the conduct of affairs in December, but died Sept. 29, 1833. In his will he appointed Maria Christina regent and guardian of Isabella, and of a second daughter, Maria Louisa Fernanda, that she had borne to him in 1832, and who afterward became the wife of Antoine, duke of Montpensier, the youngest son of Louis Philippe. Maria Christina assumed the regency Oct. 2, 1833. Having conceived a violent passion for Ferdinand Muñoz, a private soldier in the royal body guard, whose parents had a tobacco shop at Tarancon, where he was born, she married him secretly, Dec. 28, 1833. Meanwhile she lost ground with the people, partly on account of her subserviency to the *moderado* party and to France, to which policy she was instigated by her ministers Martinez de la Rosa and Toreno, but chiefly owing to her clandestine relations with Muñoz. The new charter granted by her was far from giving satisfaction to the provinces, which revolted. In the night of Aug. 13, 1836, a detachment of the provincial militia, led by *exaltados*, entered her palace of La Granja near Madrid, and after being joined by a corps of the guards stationed in the palace, they compelled the queen regent to dismiss her ministers and swear to the constitution of

1812; and a new constitution was promulgated in June, 1837. Her position, however, continued precarious. The ministers, Zea Bermudez, Toreno, Martinez de la Rosa, and Isturiz, who were successively at the head of affairs, were unable to restore her popularity. This received the greatest blow from her decree, issued June 15, 1840, in obedience to French influence, which put an end to the old municipal liberties of Spain. The people rushed to arms, and she abdicated on Oct. 12 in favor of Espartero as regent, and repaired to Paris. After the downfall of Espartero, she returned to Madrid in 1844, and on Oct. 13 she celebrated her marriage with Muñoz in public, on which occasion she created him duke of Rianzares. Though Isabella had been declared of age, she continued to intermeddle in public affairs till 1854, when she was expelled from Spain by a new revolutionary movement. She retired with her husband and their ten children to France, where she had purchased the château of La Malmaison, which she sold to Napoleon III. in 1861. She then removed to Paris, though residing part of the time at Beaumont lodge, near Windsor, England, which she subsequently sold to the Jesuits to be used as a college. In September, 1864, she returned to Madrid, where she remained till she was driven out with Isabella by the revolution of September, 1868, when she went back to Paris, where she now resides. Her husband Muñoz died near Havre, Sept. 12, 1873.

MARIA II. DA GLORIA, queen of Portugal, born in Rio Janeiro, April 4, 1819, died in Lisbon, Nov. 15, 1853. Her mother, a daughter of the emperor Francis I. of Austria, and her grandfather, John VI. of Portugal, both died in 1826, when her father succeeded as Pedro IV.; but having been made emperor of Brazil in 1822 as Pedro I., he ceded the Portuguese throne to his infant daughter (May 2, 1826), whom he wished to marry his brother Dom Miguel. But the latter, having succeeded (Feb. 26, 1828) his sister the princess Maria as regent during his niece's minority, usurped the crown four months afterward, before the queen's arrival in Portugal. Her rights were not established until after his final overthrow through a protracted civil war, and she was formally recognized as queen in September, 1834. In January, 1835, she married Duke Augustus of Leuchtenberg, who died two months afterward. In the following year she became the wife of Prince Ferdinand of Saxe-Coburg, to whom she bore three sons (the late king Pedro V., the present king Louis I., and Prince Augustus) and two daughters. At the instigation of her dictatorial prime minister Costa-Cabral, she substituted in 1842 the reactionary charter of 1826 for the liberal constitution of 1820, which she had formally adopted in 1838; but Costa-Cabral and his brother were driven from power by an insurrection in 1846, and the deposition of Maria was prevented only by foreign intervention. She discarded Saldanha in 1849.

to reappoint Costa-Cabral; and she insisted upon retaining his services despite his resignation in consequence of the adverse vote in the cortes in February, 1851, and consented to dispen-
 se with them only after Saldanha had set on foot a revolution for his rival's overthrow. Saldanha remained prime minister until after the queen's death.

MARIA DE' MEDICI, queen of France, daughter of Francis I., grand duke of Tuscany, and of the archduchess Johanna of Austria, born in Florence, April 26, 1573, died in Cologne, July 3, 1642. She was educated in utter seclusion, and knew nothing beyond the circle of the Florentine court, when, in 1599, her hand was asked for Henry IV. of France of her uncle, Ferdinand I., grand duke of Tuscany. Her marriage with Henry had been contemplated seven years before; though but for the interposition of Philip II. of Spain she would have married the duke of Parma. She was married in 1600, and in 1601 gave birth to the first dauphin who had been born since 1543, and who became Louis XIII. Maria had great cause to complain of the infidelities of her husband, and her domestic life was full of bickerings. Henry often threatened to send her back to Italy, with her favorites the Concinis, by whom she was ruled. Her coronation did not take place till May 13, 1610, the day before her husband was assassinated. By the aid of the duke of Épernon, colonel-general of the French guard, she became regent. She got rid of the prime minister Sully, and soon her government became one of the worst ever known in France. The Concinis were put to death in 1617, and she was herself exiled to Blois, her son being the chief of her enemies. She was freed from prison by Épernon, and a reconciliation was effected between her and Louis, chiefly through the aid of Richelieu, and by the same assistance Maria maintained her ascendancy at court for some years. Becoming jealous of Richelieu, she sought to overthrow his power, but was defeated and imprisoned in 1631. Escaping to the Netherlands, she remained there till 1638, and was concerned in many intrigues against the government of Richelieu. She then went to England, where her daughter Henrietta Maria was queen. Charles I. unsuccessfully endeavored to prevail upon the French government to allow her to return to France; and she became so unpopular in England that the long parliament requested her to leave the kingdom. She departed in August, 1641, parliament giving her £3,000, and promising her £6,000 more. She went to Antwerp, and took up her residence in the house of Rubens, whose patron she had been. After residing there for some weeks, she was ordered to leave Antwerp, and to proceed to Cologne, where she arrived Oct. 12. Here she finally died in comparative destitution, in a squalid chamber.

MARIA LOUISA, second wife of Napoleon I. See BONAPARTE, vol. iii., p. 47.

MARIANA, Juan, a Spanish historian, born in Talavera in 1536, died in Toledo, Feb. 6, 1623. He was educated at the university of Alcalá, and when 17 years of age joined the society of Jesus. In 1561 he was appointed professor of theology in the Jesuit college at Rome. He afterward lectured on divinity in Sicily and Paris, and finally retired to the Jesuit house in Toledo. Having been employed to examine the polyglot Bible, edited by Arias Montanus at Antwerp in 1569-'72, which had been denounced to the inquisition, he returned a favorable opinion of it, which brought upon him the displeasure of his superiors. His arrangement of the *Index Expurgatorius* of 1584, and still more his work *De Rege et Regis Institutione* (Toledo, 1599), in which he intimates that unrighteous kings and usurpers may be put to death, were also displeasing. In Paris, where Henry III. had been assassinated a few years before, the latter work was condemned to be burned by the common hangman. It aroused a violent controversy, and brought great popular odium upon the order to which Mariana belonged. In 1609 he published at Cologne "Seven Theological and Historical Treatises," two of which, "On Mortality and Immortality" and *De Alteratione Monetæ* (denouncing the falsification of the coinage by the king of Spain's ministers), were censured by the inquisition, and the author was subjected to imprisonment and penance. To the "History of Spain" he devoted the last 30 or 40 years of his life. It was published in Latin (1592-1609) and Spanish (1601; enlarged ed., 1623), and extends from the supposed peopling of Spain by Tubal, son of Japheth, to the accession of Charles V., with a summary of later events, down to 1621. The best edition is the 14th (2 vols. fol., Madrid, 1780). There is an English translation by Steevens (London, 1699). Among his other works are *Scholia Brevia in Vetus et Novum Testamentum* (Madrid, 1619), and *Discursus de Erroribus qui in Forma Gubernationis Societatis Jesu occurrunt*, published after his death and of disputed authenticity (Bordeaux, 1625).

MARIANNA, a city of Brazil, in the province of Minas Geraes, between the rivers Caruco and Seminario, 170 m. N. by W. of Rio de Janeiro; pop. about 7,000. It is situated at an elevation of 3,000 ft. above the sea, between two mountains, that to the east, Itacolumi, being nearly 6,000 ft. high. There are two large squares, seven fountains, and a bridge of a single arch crossing a torrent which runs through the centre of the town. There are eight churches, including a cathedral, a hospital, court house, and prison. Outside the town are an episcopal palace and a seminary. The climate is temperate and salubrious. Mining and agriculture are the principal occupations of the inhabitants.

MARIANNE ISLES. See LADRONES.

MARIA THERESA, a German empress, and queen of Hungary and Bohemia, born in Vienna, May 13, 1717, died there, Nov. 29, 1780.

She was the daughter of the emperor Charles VI. of Hapsburg, whose principal aim during a long reign seemed to be to secure to his heir the succession to all the hereditary dominions of his house. By ample cessions of territory to various princes of Europe, he finally attained a general acknowledgment, though not by the Bourbons, of the "pragmatic sanction;" and Maria Theresa, a princess of rare beauty and talents, received not only an education fitting her future condition, but was also early initiated into the secrets of state and admitted to the council of her father. In 1736 she was married to Francis Stephen of Lorraine, afterward grand duke of Tuscany, and eventually German emperor under the name of Francis I., who was always glad to leave affairs of state to his consort, while he employed himself in profitable private speculations. Charles died Oct. 20, 1740, and at once, in spite of the pragmatic sanction, claimant after claimant raised pretensions to the whole or parts of his possessions. The young princess saw herself surrounded by enemies. Frederick the Great of Prussia occupied Silesia; Charles Albert of Bavaria was elected emperor under the name of Charles VII.; Spain, Sardinia, and Augustus III. of Poland and Saxony threatened to enforce various claims by force of arms; and France, which had no rights of succession of its own, was ready to support those of others. George II. of England alone proved a faithful ally. At the diet of Presburg in 1741 she put herself and her infant son Joseph under the protection of the Hungarians, who promised to die for their "king" Maria Theresa; and their enthusiasm became a support powerful beyond all expectation. Frederick made peace at Breslau (1742), retaining Silesia, which he had conquered; but Charles VII. lost even his own dominion, Bavaria. This success of the Austrian arms, however, raised the apprehensions of Frederick, and the second Silesian war ensued (1744), France simultaneously declaring war against England. Louis XV. himself appeared on the field, and Marshal Saxe won battle after battle in the Netherlands; Frederick, too, was successful. Saxony, however, was now the ally of Maria Theresa. Charles VII. died soon after reëntering his capital Munich, and his son and successor not only renounced all his claims, but also supported the election of Maria Theresa's husband to the imperial throne of Germany (1745). Frederick, confirmed in the possession of Silesia, made peace at Dresden (1745). The war against Spain and France was continued, Marshal Saxe being victorious at Fontenoy (1745), Raucoux (1746), and Lawfeldt (1747), while England was successful against the pretender, in the colonies, and on the seas. Elizabeth of Russia declaring for Maria Theresa, the war was terminated by the peace of Aix-la-Chapelle (1748), Austria ceding Parma, Piacenza, and Guastalla to Don Philip, prince of Spain, and some districts of the duchy of Milan to Sardinia. Maria Theresa now turned her

principal attention to the internal affairs of her states. Following chiefly the advice of her minister Kaunitz, she introduced numerous reforms, organized the administration, alleviated the burdens of the peasantry, abolished torture, created various institutions of learning, promoted industry and trade, and, though a zealous Catholic herself, subjected the papal bulls to the *placet regium*. In regard to Hungary, she observed a mild but slowly denationalizing policy. The external diplomacy of Kaunitz was also active, and when he finally succeeded in gaining over with Mme. de Pompadour the court of France, in addition to the alliance of Russia and the house of Saxony, Frederick sought and obtained the alliance of England, and the seven years' war began (1756), of which the Prussian monarch became the hero, Laudon and Daun being his most effective Austrian antagonists. The war extended to almost all parts of the world, from the coast of Coromandel to Canada, and nearly all powers partook in it. The double peace of Paris and Hubertsburg (1763) terminated it to the advantage of Prussia and England, Frederick remaining now undisputed master of Silesia. Two years later Francis I. died, and was succeeded in the empire by his son Joseph II., and in Tuscany by Leopold, their sister Marie Antoinette being afterward married to the future French king Louis XVI. Joseph, however, enjoyed in the hereditary states of his mother only the rights of a co-regent, though his influence generally prevailed in foreign affairs, as in the case of the annexation of Galicia at the first division of Poland (1772), and of Bukovina from Turkey (1777). The peace of Teschen (1779) terminated, according to the energetic decision of the old empress, the war of the Bavarian succession. A monument 60 ft. high, representing Maria Theresa surrounded by the principal statesmen of her time, is to be completed at Vienna in 1875. Her correspondence, comprising several previously unknown letters, has been published in French by Alfred von Arneth (3 vols., Paris, 1874).

MARIA-THERESIOPEL. See SZABADKA.

MARIAZELL, a village in Styria, Austria, 55 m. S. W. of Vienna (pop. about 1,000), situated in a picturesque country, and celebrated for its shrine of the Virgin, which makes it the principal resort of pilgrims in the Austrian monarchy. From May to September there are 80 great processions from different parts of Austria, and the number of pilgrims annually is estimated at 250,000.

MARICOPA, a central county of Arizona, bounded E. by New Mexico and S. by the Gila river, and intersected by the Salt river and other tributaries of the Gila; area, about 14,500 sq. m. It has been recently formed, and is not included in the census of 1870. The settlements are chiefly in the valley of Salt river, one of the largest and most productive in the territory. Irrigation is practised, the river supplying abundant water. The chief crops

are wheat, barley, and Indian corn. The valley of the Gila also contains large tracts of land suited to agriculture, and the table lands and mountains adjacent furnish good pasture throughout the year. The E. portion is generally broken and mountainous, but is watered by a number of streams, and contains much timber. Gold, silver, copper, and lead exist in most of the mountain ranges. The Apaches have held possession of the greater portion of the county. Capital, Phoenix.

MARICOPAS. See COCO-MARICOPAS.

MARIE, Charles François Maximilien, a French mathematician, born in Paris, Jan. 1, 1819. He left the military school of Metz in 1841, and has since devoted himself to researches in the most abstruse parts of mathematical science. His methods were for a long time the subject of ridicule, notwithstanding they had been approved by M. Lamé and M. Poncelet. In 1858 M. Léonville gave him the use of the columns of his mathematical journal to explain his discoveries; and in 1863, after violent opposition, he was appointed an examiner in the polytechnic school. He has published *Leçons d'arithmétique* (Paris, 1860), and *Leçons d'algèbre* (1860), treating the theory of the quantities called imaginary, and *Questions sociales* (1869).

MARIE AMÉLIE, queen of the French, born at Caserta, near Naples, April 26, 1782, died at Claremont, near Windsor, England, March 24, 1866. Her father was Ferdinand I., king of the Two Sicilies, and her mother Carolina Maria, archduchess of Austria. Her brother succeeded to the throne of Naples, and her four sisters were respectively empress of Austria, grand duchess of Tuscany, queen of Sardinia, and queen of Spain. In 1798, when Naples was invaded by the French, she retired with her mother to Palermo. In June, 1800, she went to Vienna, and returned in 1802 to Naples, but renewed political outbreaks forced the royal family to return to Palermo. There she became acquainted in 1808 with Louis Philippe, whose wife she became, Nov. 25, 1809. She continued to reside at Palermo till the restoration called her husband to Paris in September, 1814. The events of the hundred days soon compelled her and her family to take refuge in England. She returned to France in 1817, and from that time to 1830 resided at Neuilly. Her legitimist tendencies led her to view with regret the revolution of 1830, and she manifested a repugnance, based on scruples, to Louis Philippe's acceptance of the crown. After his accession Marie Amélie devoted herself exclusively to domestic life, and was remarkable for her charities, accomplishments, and piety. In 1848 she implored Louis Philippe not to abdicate; but when further resistance was useless she accompanied him to Évreux, where for safety she separated from him, rejoined him at Honfleur, and accompanied him to Claremont, where she took the title of countess of Neuilly.—See *Vie de Marie-Amélie, reine des Français*, by Trognon (Paris, 1871).

MARIE ANTOINETTE, Joséphe Jeanne de Lorraine, queen of France, born in Vienna, Nov. 2, 1755, executed in Paris, Oct. 16, 1793. She was the youngest daughter of the emperor Francis I. (who died in 1765) and Maria Theresa. Her marriage with the French dauphin, the future Louis XVI., was early determined upon by her mother, with a view of strengthening Austria against Prussia. The princess was brought up in the unconventional manner of the imperial family circle; but while taught to be natural and unaffected, her attainments were not above the superficiality of merely fashionable accomplishments. French actors taught her elocution; a Frenchman instructed her in dancing; and though Maria Theresa inculcated in her mind solid moral principles, she regarded the rather frivolous character of her education as necessary to qualify her for the French throne. The abbé de Vermond, a worthless person, was brought in 1769 from Paris as her tutor, and afterward became her reader. She went to France in her 15th year, and was enthusiastically received all along the journey, and especially at Strasburg by the prince de Rohan, then coadjutor of his uncle the cardinal, who afterward, as ambassador in Vienna, shocked Maria Theresa by his levity and dissipations, and who subsequently, while cardinal and royal chaplain, implicated Marie Antoinette in the affair of the diamond necklace. Her marriage with the dauphin was celebrated at Versailles, May 16, 1770, and was followed by sumptuous festivities, marred however by a number of casualties, involving the loss of several lives, which were regarded by the superstitious as ominous. The powerful anti-Austrian party at the court, and the daughters of Louis XV., as well as Mme. du Barry, the king's mistress, were unfriendly to the new dauphiness, though the old king himself was pleased with her vivacity. But this peculiar trait of her character, and her dislike of the restraints of court life, alienated from her the rigid upholders of etiquette among the nobility, while no greater contrast could be imagined than that between the joyous and impulsive young princess, fond of pleasure, excitement, and society, and her grave, sedate, and ungainly, though good-natured and upright husband, who delighted chiefly in mechanical pursuits, and in a life of good fare, seclusion, and meditation. She was consequently left to drift along in a social set including many persons of inferior moral culture, who encouraged her in indiscretions which were misconstrued and injured the popularity which her youth and fascinating manners had at first gained for her. After her husband's accession to the throne (May 10, 1774), her charities enlisted popular sympathy for a time, but her wayward conduct, which occasionally wore a coloring of positive impropriety, was grossly exaggerated by her detractors. Yet, though her admirers were numerous, she gave no cause of complaint to her husband, with whom she lived

in perfect harmony, and to whom she bore four children. Louis XVI. humored and honored her, while she, without deep feelings of love, never ceased to respect him. According to the best authorities, she led a virtuous life in the midst of vicious associations. But the haughty spirit of her race, which asserted itself occasionally despite her general urbanity, could not always be reconciled with her fondness for familiar intercourse and her desire to please. Shortly after she became queen she conceived a warm friendship for the princess de Lamballe, and insisted upon restoring for her benefit the office of superintendent of the queen's household. This entailed additional expense, and gave offence to her former ladies in waiting, who resigned, while other ladies of the court declined to serve under the princess. At the same time she was on bad terms with her brother-in-law the count of Provence (afterward Louis XVIII.), the prince de Condé, and the duke of Orleans, and she made bitter enemies of many of the women of easy virtue who had flourished under Louis XV., and whom she discarded. Yet while setting such examples, she was forbearing toward the failings of some of her own favorites; and this want of consistency strengthened her enemies, who made every effort to injure her in public estimation. In this they succeeded, especially after the sensation produced by the affair of the necklace (1785), in which Marie Antoinette was scandalously implicated by the woman Lamotte and the cardinal de Rohan, and for which the two latter were imprisoned. (See LAMOTTE-VALOIS.) Nothing could be proved against Marie Antoinette, who exerted herself to alleviate the condition of the prisoner Lamotte, whose husband, and she herself afterward, overwhelmed the queen with defamations. This affair became a convenient weapon in the hands of the queen's enemies. Her famous parties at the Trianon were described as orgies, and her fondness for private theatricals and for unceremonial balls and amusements became pretexts for atrocious calumnies. At the same time she was denounced as hostile to France, and as solely laboring in the interest of Austria. Ever since the birth of the first dauphin (1781) she had been charged, and not without some reason, with mixing herself up too much with politics. But at length she was accused of being the cause of all the national and financial troubles; of having procured vast sums for her brother, the emperor Joseph II.; of having helped the Polignac family to grow rich at the expense of the state; and of warmly supporting the administration of the unpopular Calonne, who gratified all her caprices, and whose influence became paramount after the death of Vergennes (1787). Marie Antoinette was often admonished by her brother Joseph, as she had been by her mother, who were especially alarmed at her loss of prestige consequent upon her over-familiar intercourse with the Polignacs and other friends.

Many sarcastic songs were circulated in Paris, in which she was held up to ridicule and opprobrium. Her opposition to the assembling of the notables for the consideration of the financial situation confirmed the popular prejudices against her, and she was nicknamed *Madame D ficit*. The aid afforded to the American colonies, of which she was an enthusiastic advocate, had been an additional source of financial embarrassment. In fact, she wrote to one of her friends, April 9, 1787: "Dearly enough do we pay to-day for our rejoicing and enthusiasm over the American war." Calonne was removed at her instigation, and replaced by Lom nie de Brienne, archbishop of Toulouse, a prelate fond of theatricals and puerilities, and an especial favorite of the queen. She joined him in a strenuous opposition to Necker's suggestion of a convocation of the states general, which was taken up by Lafayette and by public opinion as the only alternative to revolution. But, frightened at the tumults in Paris and other places, she at last prevailed upon the prime minister to issue a decree (Aug. 8, 1788) for the meeting of the states general in May, 1789. The king continued to lead his placid life, while the queen controlled affairs of state. Lom nie de Brienne having lost her confidence, she placed Necker at the head of the cabinet. But the outbreak of the political storm which was gathering round the monarchy was accelerated by her want of earnestness and sincerity in the proposed creation of a third estate, which she regarded as a death-blow to the nobility and as a menace to the throne. At the opening of the states general, May 5, 1789, she was received in a manner which deeply offended her pride; and so low had she already sunk in public estimation that the habitual expression of sympathy on occasions of bereavement in the royal family were withheld by that body on the death of her first-born son, the dauphin, June 4, 1789. During the subsequent political developments the count de la Marck in vain appealed to her to come to an understanding with Mirabeau, to which she replied that her husband would probably never become so miserable as to be obliged to resort to such an expedient; but at a later period, when she in her turn in vain attempted to conciliate Mirabeau, she exclaimed that it was her destiny to make mischief. Appalled at the signs of the times, and at the detestation in which she was held by the populace, she led an uneasy life at the Trianon till Oct. 5, 1789, when that palace was invaded by the mob, from whose violence she only escaped by her own intrepidity. While she fully recognized the peril of the situation, the king consented to accompany the populace to Paris, a step which she regarded as fatal, and she very reluctantly went with him and their children. Feeling that her unpopularity aggravated the difficulties of her husband's position, she now strove to remain in the background, but still

virtually continued to control affairs; and as some of her measures conflicted with those urged by the king's other advisers, many cross purposes increased the prevailing uncertainty and confusion. She was unable, and the king was too lethargic, to secure the coöperation of competent statesmen in building up a constitutional monarchy, which might perhaps have saved the throne. Despairing at last, she obtained Mirabeau's consent, shortly before his death, to the flight of the royal family, which ended so ignominiously (1791). During the insurrection of June 20, 1792, Madame Elisabeth, the devoted sister of the king, was mistaken for Marie Antoinette by the mob, who shouted *À bas l'Autrichienne*. The people had long been made by her adversaries to believe that she was surrounded by a so-called Austrian cabinet, which was planning the ruin of France; and the mourning at the court over the death of Marie Antoinette's brother, the emperor Leopold, which began March 13, 1792, was jeered at and turned into public rejoicing. During the attack upon the Tuileries, June 20, she overawed the coarse women who came to insult her by her firm and noble attitude, which she also displayed on Aug. 10, when the palace was sacked, and she and her family took refuge in the national assembly, though she long declined to leave the Tuileries, imploring the king rather to nail her to the walls of the palace. On Aug. 13 the royal family was removed to the Temple prison, where she was separated from her friends, including Mme. de Lamballe, who soon fell a victim to the September massacre, and whose bleeding head was paraded before the queen's windows. She was also speedily separated from her husband, and did not see him again till Jan. 20, 1793, the eve of his execution. In the night of Aug. 1-2, when she was removed to the Conciergerie, she took leave of Madame Elisabeth and of her daughter; and having long prepared herself for her inevitable fate, she bore all her agonies with stoical fortitude. Before the revolutionary tribunal (Oct. 14), she showed the same calmness and resignation. Instead of vindicating herself, as her husband had attempted to do, she hardly condescended to reply, excepting in the most laconic manner, to the questions put to her; and she demonstrated by her attitude that she regarded the trial as a farce and her death sentence as a foregone conclusion. Only when she was accused by Hébert (*Père Duchesne*), the principal witness against her, of having debauched her own boy, who had slept in the same bed with her and Madame Elisabeth, her indignant denial of that accusation, and appeal to all the mothers present, struck conviction into the minds of the most obdurate. Even Fouquier-Tinville, the public prosecutor, and the most infuriated women seemed to sympathize for once with the unfortunate queen. The trial lasted two days. She insisted that nothing was proved against her, and that she had only done her duty as a wife in

obeying her husband. She was found guilty of having conspired against France abroad and at home, and sentenced to death at 4 A. M., Oct. 16. She was then taken to a cell of condemned prisoners at the Conciergerie, where she immediately wrote a touching and spirited letter to Madame Elisabeth, which has been preserved. Girard, the metropolitan vicar, having been sent to her by the authorities to attend her last moments, he besought her to dedicate her life to God in expiation of her crimes; to which she replied that he should speak of her mistakes, but never of her crimes. Dressed in plain white, and having cut off her beautiful blonde hair with her own hands, she was conveyed to the guillotine like other victims, only that more than 30,000 soldiers were stationed in the streets, and that the cries of *Vive la république! À bas la tyrannie!* were incessant. She showed neither haughtiness nor humility in her bearing, stepped with firmness upon the scaffold, and her head fell at 12.15 P. M. Her remains were interred in the cemetery of the Madeleine, by the side of those of Louis XVI. In 1815 they were removed to the vaults of St. Denis.—The most faithful likeness of Marie Antoinette is the portrait by the Swedish painter Rossline. It was also drawn by Mme. Vigée-Lebrun, who published souvenirs of the queen. See also *Mémoires sur la vie privée de Marie-Antoinette*, by Mme. Campan (Paris, 1826); *Histoire de Marie-Antoinette*, by Edmond and Jules de Goncourt (1859); *Maria Theresa und Marie Antoinette: Ihr Briefwechsel während der Jahre 1770-'80* (Vienna, 1865), and *Marie Antoinette, Joseph II. und Leopold II.: Ihr Briefwechsel* (Vienna, 1866), both by Alfred von Arneth. Arneth's *Correspondance de Marie-Thérèse* (3 vols., Paris, 1874) shows that Marie Antoinette was constantly watched by her mother, through secret agents, with a view of protecting her.

MARIENBAD, a watering place in Bohemia, 20 m. S. S. W of Carlsbad, and 76 m. W. by S. of Prague; pop. about 1,000. It contains a number of mineral springs, beneficial for diseases of the chest, bowels, and skin, as well as for rheumatic complaints, and is annually visited by thousands of persons. The waters of some of the springs, particularly of the Kreuzbrunnen, are largely exported to foreign countries. The watering place is of comparatively recent origin, and was opened out of the forest which covered its site in 1810.

MARIENBURG, a town of Prussia, in the province of West Prussia, on the Nogat, 28 m. S. E. of Dantzic; pop. in 1871, 8,235. It has a gymnasium, a normal school, and an institution for the deaf and dumb. The castle, which was formerly the seat of the grand master of the Teutonic order, was restored in 1817-'24. The town remained with the Teutonic order till 1457, when Poland took possession. In 1772 it was united with Prussia.

MARIENWERDER, a town of Prussia, capital of an administrative district in the province of

West Prussia, on the Little Nogat, 45 m. S. E. of Dantzic; pop. in 1871, 7,172. It is one of the most beautiful towns of eastern Germany, has a large cathedral church, a gymnasium, a hospital for blind soldiers, and an ancient castle which is now used as a prison. The most important branches of industry are woollen cloth weaving, brewing, and distilling.

MARIES, a S. central county of Missouri, intersected by the Gasconade river; area, about 500 sq. m.; pop. in 1870, 5,916, of whom 22 were colored. The surface is broken and generally well timbered; the soil of the valleys is fertile, that of the uplands poor. Iron, lead, and copper are found. The chief productions in 1870 were 79,243 bushels of wheat, 163,479 of Indian corn, 72,075 of oats, 8,887 of potatoes, 17,672 lbs. of tobacco, 15,152 of wool, and 41,633 of butter. There were 2,720 horses, 466 mules and asses, 1,998 milch cows, 4,337 other cattle, 8,095 sheep, and 10,759 swine. Capital, Vienna.

MARIETTA, a city and the capital of Washington co., Ohio, at the confluence of the Ohio and Muskingum rivers, and at the terminus of the Marietta and Cincinnati and the Marietta, Pittsburgh, and Cleveland railroads, 85 m. E. S. E. of Columbus; pop. in 1850, 3,175; in 1860, 4,323; in 1870, 5,218. Including Harmar, which is part of the town, the population is over 7,000. It is regularly laid out, with wide streets and neatly built houses. On the site of the city there is a remarkable group of ancient works, which are described in Squier and Davis's "Ancient Monuments of the Mississippi Valley" as consisting of "two irregular squares (one containing 40 acres area, the other about 20 acres), in connection with a graded or covered way, and sundry mounds and truncated pyramids. The town of Marietta is laid out over them, and, in the progress of improvement, the walls have been considerably reduced and otherwise much obliterated; yet the outlines of the entire works may still be traced. The walls of the principal square, where they remain undisturbed, are now between 5 and 6 ft. high by 20 or 30 ft. base; those of the smaller enclosure are somewhat less. The entrances or gateways at the sides of the latter are each covered by a small mound placed interior to the embankment; at the corners the gateways are in line with it. The larger work is destitute of this feature, unless we class as such an interior crescent wall covering the entrance at its southern angle." Marietta has considerable trade in petroleum, which is obtained in the vicinity, and contains several iron foundries, manufactories of buckets, chairs, &c., a union bank, and two national banks. It is the seat of Marietta college, the grounds of which occupy a square, and contain four buildings. This institution was established in 1835, and in 1873-4 had 11 professors and instructors, 182 students (93 in the collegiate and the rest in the preparatory department), 360 alumni,

and libraries containing 25,000 volumes. The city has flourishing graded schools, including a high school, three weekly newspapers (one German), and 15 churches. Marietta is the oldest town in the state, having been settled in 1788 by New Englanders under Gen. R. Putnam, and named in honor of Marie Antoinette.

MARIETTE, *Auguste Édouard*, a French Egyptologist, born in Boulogne, Feb. 11, 1821. He was educated at the college of Boulogne, in which he was subsequently a teacher of grammar and of drawing. He early became interested in antiquities, and his first publication, *Lettres à M. Bouillet* (Paris, 1847), was a dissertation on the names of the cities that had formerly occupied the site of Boulogne. Egyptian hieroglyphics attracted his attention, and by the aid of books he became so well versed in Egyptology that he was appointed in 1848 to a situation in the Egyptian museum in the Louvre; and in 1850, at the recommendation of the institute, he was sent by the government on a scientific mission to Egypt. There his attention was chiefly directed to the remains of Memphis, and his excavations led to most important discoveries. Among these is the discovery of the Serapeum, close by the three great pyramids, and the first of the temples of Memphis disinterred. M. Mariette told Mr. Bayard Taylor, who visited him at the scene of his explorations in 1851, that an inscription which he found on one of the blocks quarried out of a mound near Mitrahenny induced him to believe that the principal part of the city lay to the westward, and accordingly he began to sink his pits four miles from the spot which archaeologists had fixed upon as the site of Memphis. He soon struck upon an avenue of sphinxes, which led to the Serapeum or temple of Serapis mentioned by Strabo, an enormous structure of granite and alabaster, containing within its enclosure the sarcophagi of the bulls of Apis from the 19th dynasty to the time of the Roman supremacy. He found also 2,000 sphinxes, between 4,000 and 5,000 statues, reliefs, and inscriptions, eight colossal statues, evidently the product of Grecian art, and streets, colonnades, public and private edifices, and other marks of a great city. Subsequently he discovered an entrance to the great sphinx at Gizeh, and the clearing away of the sand at the base has left no doubt that this monument was sculptured from the immense rock which forms its foundation. On his return home, he was in 1855 appointed assistant conservator of the Egyptian museum in the Louvre, and in the same year sent to study Egyptian antiquities in the museum at Berlin. Having returned to Egypt, he was made by the viceroy director of the department for the preservation of Egyptian antiquities, with the title of bey, and an annual allowance for the prosecution of his researches. Among his later excavations, resulting in interesting and important discoveries, are those at Tanis, disclosing the monuments of the

kings of the shepherd dynasty, and at Thebes and elsewhere of monuments and inscriptions which explain the genealogy and chronology of different dynasties. In 1860 he discovered at Thebes the mummy of Queen Aah-hotep, of the 18th dynasty, and her jewels, consisting of a long gold chain, a diadem with two golden sphinxes, a breastplate of open work, a richly chased dagger, bracelets, earrings, and other ornaments, all of exquisite workmanship. These were shown in the Paris exhibition of 1867, and are now spoken of as "the pride of the museum of Boolak." This museum is temporarily located, and is to be removed to Cairo. In April, 1874, Bayard Taylor again visited Mariette, and described his collections, which are arranged in the Boolak museum according to their civil or religious character, those of the earlier dynasties having the most conspicuous place. Three statues in the court belong to the age of the shepherd kings. The main vestibule is crowded with relics of the oldest Egyptian art. In the main hall are wooden statues belonging to the 4th dynasty, two painted limestone statues belonging to the 3d, and a granite statue of Cephren, the builder of the second pyramid, found by Mariette in a well in the granite temple discovered in 1866 near the sphinx. Even more interesting is the vast collection of furniture, household articles, implements of trade, glass and earthen ware, &c., revealing the civilization and domestic life of Egypt 4,000 years ago. In this museum is also the trilingual Canopic stone discovered at Tanis in 1866 by Lepsius, Reinisch, and Rösler. Mariette's discoveries thus far have thrown comparatively little light upon the sojourn of the Israelites in Egypt, though they have afforded grounds for many probable chronological conjectures; but the revelations of the earliest periods resulting from his researches are of great value. He has published *Mémoire sur la mère d'Apis* (1856); *Aperçu de l'histoire d'Égypte* (1864); *Nouvelle table d'Abydos* (1865); *Le Sérapéum de Memphis* (in 9 parts fol., with 110 plates, 1857-'64); and *Fouilles exécutées en Égypte, en Nubie et au Soudan d'après les ordres du viceroy d'Égypte* (fol., 1867). The *Nouvelle table d'Abydos* gives an account of the discovery of a more perfect tablet than the one formerly found in Abydos and preserved in the British museum. This second tablet supplies nearly all the vacancies which occur by mutilation in the first, and furnishes a list of kings of the first six dynasties, nearly as complete as Manetho's, and corroborating the list of that historian. For the importance of Mariette's discoveries, historically and chronologically considered, see Lenormant and Chevalier, *Manuel d'histoire ancienne de l'Orient* (3 vols., Paris, 1868-'9; English edition, 2 vols., 1869-'70).

MARIGNANO, or *Marignan*. See **MELEGNANO**.

MARIGOLD, the usual name of garden plants of two distinct genera of *compositæ*. The old naturalists called them *Mary Gowles*, a name

from the Anglo-Saxon for another plant, which has been transferred to these, probably on account of a similarity in color. The garden or pot marigold, *calendula officinalis*, a spreading plant about a foot high with succulent oblong, entire, strong-smelling leaves, is still to be found in country gardens; the heads have numerous ray flowers, and these are the only ones that produce seed, which are in long, curved, roughened achenes; the disk flowers as well as those of the ray are yellow; the flowers have been rendered double in cultivation. The common marigold was once used in cookery, imparting a flavor to soups and broths, and thus has long had a place in the kitchen garden. It was formerly, among other uses, employed as a carminative; and its dried florets were used to adulterate saffron, and by dairy maids to impart a rich color to their cheese and butter. There are lemon-colored varieties, but the usual color is a rich orange yellow. —The showy plants known in gardens as the

African and French marigolds belong to the genus *tagetes*, and, notwithstanding their geographical garden names, are natives of South America and Mexico; they are annuals, with mostly pinnate leaves and heads of yellow, orange, or brownish flowers, with a smooth cup-shaped involucre; the ray flowers only are pistillate, but in most of the garden forms they are double by the conversion of the disk flowers into ligulate ones like those of the ray. The so-called



African Marigold (*Tagetes erecta*).

African marigold (*T. erecta*) has large flowers varying from lemon color to orange. It is showy, but a much coarser plant than the French (*T. patula*), which has more delicate leaves, and flowers varying from pale yellow to a rich orange brown, often handsomely striped or bordered with different shades. The most beautiful and delicate of all is the comparatively recent *tagetes signata*, with very finely divided foliage of a rich deep bluish green color, and producing a great profusion of small single flowers, with five orange-colored rays which are marked with a darker spot at the base; a dwarf form of this, var. *pumila*, is a fine plant grown as a single specimen, and it is useful in masses. The foliage of the species before mentioned has a strong and unpleasant odor, but there is a sweet-scented one, *T. lucida*, the leaves of which have the odor of anise; its flower heads are very small and borne in clusters; it is much less cultivated than formerly, and though a perennial is treat-

ed as an annual. The different sorts are readily raised from seeds, sowing in June in the open ground, or earlier in hotbeds, and trans-



French Marigold (*Tagetes patula*).

planting when 3 or 4 in. high.—On the alluvial banks of rivers, from Illinois southward, is an American plant belonging to this group, known as the fetid marigold (*dysodia chrysanthemoides*), furnished with pellucid glands, which give out a strong odor; the flower heads are terminal and the flowers yellow. The marsh marigold (*caltha palustris*) belongs to the order *ranunculaceae*.

MARIN, a W. county of California, bounded E. by the bays of San Pablo and San Francisco, and S. and W. by the Pacific ocean; area, 570 sq. m.; pop. in 1870, 6,903, of whom 361 were Chinese. The surface is rugged and mountainous, and only a small portion of the soil is adapted for cultivation, though much of it is well suited for grazing. The valleys are highly productive. It is intersected by the San Francisco and North Pacific railroad. The chief productions in 1870 were 57,880 bushels of wheat, 297,744 of oats, 37,755 of barley, 157,245 of potatoes, 2,107,755 lbs. of butter, 381,300 of cheese, and 12,054 tons of hay. There were 2,671 horses, 18,655 milch cows, 10,443 other cattle, 2,067 sheep, and 6,606 swine; 11 brick kilns, 1 saw mill, and 1 paper mill. Capital, San Rafael.

MARINA, Malintzin, or Malineche, an Indian woman who rendered efficient aid in the conquest of Mexico. She was a native of the province of Guazacoalcos, and of noble blood, though sold as a slave in her childhood to the Maya Indians of the frontier of Yucatan. Being thus familiar with the two principal languages of Mexico, she was presented to Cortes in Tabasco by a native chief, and, quickly acquiring Spanish, made herself indispensable to the conquerors as an interpreter. She was much beloved by the Mexicans, and exerted a great influence

in restraining the barbarities against her countrymen which were but too common. Cortes made her his mistress, and by him she had a son, Don Martin Cortes, who figured in the political history of the colony. After the marriage of Cortes, she became the wife of the comendador Juan de Jaramillo, and survived till after the year 1550, living chiefly at Jalpan on the isthmus of Tehuantepec, where a mound is still shown as her burial place.

MARINER'S COMPASS. See COMPASS.

MARINI, or **Marino**, Giambattista, an Italian poet, born in Naples, Oct. 18, 1569, died there, March 25, 1625. He was driven from his home on account of his repugnance to the legal profession, and devoted himself to poetry under the influence of Tasso. The grand admiral, Prince Conca, made him his secretary, but a love affair drove him from Naples. In Rome he found a patron in Cardinal Pietro Aldobrandini, whom he accompanied to the court of Duke Charles Emanuel at Turin. His panegyric on the latter won for him the post of ducal secretary; but he wrote a satire against Murtola, a fellow secretary, who wrote a counter satire and attempted to shoot him; and on being released from prison at Marini's intercession, he ruined the latter by pointing out disparaging allusions to the duke in one of his poems. Marini was imprisoned, and recovered his liberty only through the intervention of Cardinal Gonzaga. He next went to Paris, to the court of Margaret of Valois, widow of Henry IV., and after her death he became a favorite and pensioner of Maria de' Medici. He returned to Italy in 1622, and was received with great enthusiasm at Rome, and elected prince of the academy of the Umoristi. His *Adone* (Paris, 1623; new and complete ed., 4 vols., London, 1789) was regarded as a masterpiece at the time of its publication, though full of mannerism and defects, and so licentious that its circulation was not permitted. Among his other works are *La strage degli innocenti* (Rome, 1633), and several exquisite sonnets. There was for a time a large class of imitators of his style, called Marinists.

MARIO, Giuseppe, marquis di Candia, an Italian singer, born in Cagliari, Sardinia, Oct. 18, 1810. He received an excellent musical education, and in 1830 entered the Sardinian military service. Having been ordered to Cagliari for certain youthful indiscretions, he resigned his commission; but upon the refusal of government to accept his resignation, he escaped to Paris, and by his admirable tenor voice soon attracted attention in the musical salons of that city. For the sake of satisfying his creditors, he accepted an engagement at the French opera at a liberal salary, assumed the name of Mario, and, after two years' study at the conservatory, made his debut in December, 1838, in *Robert le diable*, with decided success. In the succeeding year he sang with Rubini at the Italian theatre, and formed one of that brilliant galaxy of singers then upon the stage;

comprising Rubini, Lablache, Tamburini, Malibran, Sontag, Persiani, and Grisi. From that period, he was constantly before the public, occupying the position of the first tenor singer upon the stage. After performing principally in London and Paris, he visited Russia in 1845, remaining there five years, and in 1850-'60 generally sang in London in the spring and summer and in Paris in the winter. In 1854-'5 he accompanied Grisi, with whom he had lived for many years, having by her a family of children, and whom he finally married, on an operatic tour through the chief cities of the United States. In 1859 he appeared in London and Paris in the part of Don Giovanni, in the opera of that name, transposed to suit his voice. On June 18, 1871, he took his farewell of the stage at Covent Garden in *La favorita*. In the autumn of 1872 he again visited the United States on a concert tour. His voice had quite failed him, however, and his reappearance was a detriment to his reputation. He possessed respectable dramatic abilities, and excelled in parts like Almaviva in the "Barber of Seville." Among the operas in which he has principally appeared are *La donna del lago*, *La gazza ladra*, *Cenerentola*, *Moise*, and others by Rossini; *La sonnambula*, *Norma*, and *I puritani*, by Bellini; *Lucia di Lammermoor*, *La favorita*, *Lucrezia Borgia*, *Don Pasquale*, &c., by Donizetti; and *Ernani*, *La traviata*, and *Il trovatore*, by Verdi.

MARION, the name of 17 counties in the United States. **I.** A N. county of West Virginia, drained by the Monongahela and its branches; area, 275 sq. m.; pop. in 1870, 12,107, of whom 78 were colored. It has an undulating surface with considerable woodland, and a fertile soil. Coal and iron ore abound. The Baltimore and Ohio railroad intersects it. The chief productions in 1870 were 26,538 bushels of wheat, 63,643 of Indian corn, 29,819 of oats, 12,780 lbs. of wool, 22,927 of butter, and 3,780 tons of hay. There were 907 horses, 1,110 milch cows, 2,377 other cattle, 4,924 sheep, and 508 swine. Capital, Fairmont. **II.** An E. county of South Carolina, bordering on North Carolina, bounded E. by Little Pedee and Lumber rivers, and S. by the Great Pedee and Lynches creek; the Little and Great Pedee also intersect it; area, 1,200 sq. m.; pop. in 1870, 22,160, of whom 10,732 were colored. The Wilmington, Columbia, and Augusta railroad traverses it. The surface is level and the soil moderately fertile. The chief productions in 1870 were 190,326 bushels of Indian corn, 11,412 of oats, 58,103 of sweet potatoes, 12,450 of peas and beans, 6,910 bales of cotton, and 415,382 lbs. of rice. There were 1,419 horses, 957 mules and asses, 3,633 milch cows, 5,468 other cattle, 4,420 sheep and 19,521 swine. Capital, Marion Court House. **III.** A W. county of Georgia, drained by tributaries of the Chattahoochee and Flint rivers; area, 432 sq. m.; pop. in 1870, 8,000, of whom 3,830 were colored. The surface is undulating

and the soil generally fertile. A branch of the Southwestern railroad passes through the N. W. corner. The chief productions in 1870 were 9,523 bushels of wheat, 163,298 of Indian corn, 20,967 of sweet potatoes, 15,050 lbs. of butter, 5,439 bales of cotton, and 5,330 gallons of molasses. There were 514 horses, 1,002 mules and asses, 1,404 milch cows, 2,480 other cattle, 1,260 sheep, and 7,448 swine. Capital, Buena Vista. **IV.** A central county of the peninsula of Florida, intersected by the Ocklawaha river, and partly bounded S. by the Withlacoochee; area, 1,760 sq. m.; pop. in 1870, 10,804, of whom 7,878 were colored. The surface is level and the soil fertile. There are numerous lakes, of which the largest are Orange, Bryant, and Ware. The chief productions in 1870 were 129,596 bushels of Indian corn, 3,355 of oats, 23,968 of sweet potatoes, and 3,858 bales of cotton. There were 637 horses, 906 mules and asses, 3,035 milch cows, 306 working oxen, 458 other cattle, 442 sheep, and 3,488 swine. Capital, Ocala. **V.** A N. W. county of Alabama, bordering on Mississippi, drained by branches of the Tennessee and Tombigbee rivers; area, about 700 sq. m.; pop. in 1870, 6,059, of whom 224 were colored. The surface is uneven and the soil generally fertile. The chief productions in 1870 were 5,108 bushels of wheat, 90,429 of Indian corn, 15,546 of sweet potatoes, 1,010 lbs. of tobacco, 9,691 of wool, 25,335 of butter, and 463 bales of cotton. There were 662 horses, 1,269 milch cows, 665 working oxen, 1,707 other cattle, 2,999 sheep, and 5,765 swine. Capital, Pikeville. **VI.** A S. county of Mississippi, bordering on Louisiana, and drained by Pearl river; area, 1,224 sq. m.; pop. in 1870, 4,211, of whom 1,649 were colored. It has an undulating surface and a fertile soil on the borders of the streams. The chief productions in 1870 were 69,691 bushels of Indian corn, 22,268 of sweet potatoes, 4,949 gallons of molasses, 793 bales of cotton, and 32,038 lbs. of rice. There were 797 horses, 2,206 milch cows, 4,637 other cattle, 4,827 sheep, and 8,574 swine. Capital, Columbia. **VII.** A N. E. county of Texas, bordering on Louisiana, and bounded S. by Big Cypress bayou and several lakes, which with Red river afford navigation to New Orleans; area, 320 sq. m.; pop. in 1870, 8,562, of whom 4,362 were colored. The bottom lands are very fertile. It has an abundance of timber of all kinds, and iron ore of superior quality; and there are seven mineral springs. The chief productions in 1870 were 73,118 bushels of Indian corn, and 8,345 of sweet potatoes. There were 362 horses, 943 milch cows, 2,363 other cattle, and 3,241 swine. Capital, Jefferson. **VIII.** A N. county of Arkansas, bordering on Missouri, drained by White river and its branches; area, 900 sq. m.; pop. in 1870, 3,979, of whom 19 were colored. It contains lead ore, and a variegated marble is found in the W. part. The chief productions in 1870 were 12,822 bushels of wheat, 115,169

of Indian corn, 302 bales of cotton, 19,361 lbs. of tobacco, 39,024 of butter, and 4,720 gallons of sorghum molasses. There were 845 horses, 849 milch cows, 1,763 other cattle, 2,283 sheep, and 7,952 swine. Capital, Yellville. **IX.** A S. county of Tennessee, bordering on Alabama, partly bounded S. E. by the Tennessee, and intersected by the Little Sequatchie river; area, 600 sq. m.; pop. in 1870, 6,841, of whom 915 were colored. The surface is hilly and broken, being traversed by ridges of the Cumberland mountains. The Jasper branch of the Chattanooga railroad terminates at the county seat. The chief productions in 1870 were 28,134 bushels of wheat, 265,100 of Indian corn, 27,989 of oats, 7,504 of Irish and 10,662 of sweet potatoes, 17,487 lbs. of tobacco, 9,157 of wool, 64,742 of butter, and 724 bales of cotton. There were 1,571 horses, 1,977 milch cows, 4,289 other cattle, 5,605 sheep, and 17,020 swine. Capital, Jasper. **X.** A central county of Kentucky, drained by the Rolling fork of Salt river; area, 304 sq. m.; pop. in 1870, 12,838, of whom 3,343 were colored. The surface is hilly and the soil generally fertile. The Knoxville branch of the Louisville, Nashville, and Great Southern railroad passes through it. The chief productions in 1870 were 93,530 bushels of wheat, 395,170 of Indian corn, 72,812 of oats, 16,676 of potatoes, 132,293 lbs. of tobacco, 22,102 of wool, 193,397 of butter, and 3,274 tons of hay. There were 3,398 horses, 1,138 mules and asses, 2,070 milch cows, 4,042 other cattle, 7,578 sheep, and 22,460 swine; 3 manufactories of agricultural implements, 5 of carriages and wagons, 4 of saddlery and harness, 1 woollen factory, 5 distilleries, 2 tanneries, 2 flour mills, 5 saw mills, and 2 planing mills. Capital, Lebanon. **XI.** A central county of Ohio, drained by the Scioto, Little Scioto, and Whetstone or Olentangy rivers; area, 384 sq. m.; pop. in 1870, 16,184. It has a level surface and fertile soil. It is intersected by the Atlantic and Great Western and the Cleveland, Columbus, Cincinnati, and Indianapolis railroads. The chief productions in 1870 were 285,019 bushels of wheat, 635,291 of Indian corn, 196,639 of oats, 53,720 of potatoes, 702,090 lbs. of flax, 337,617 of wool, 439,226 of butter, and 29,062 tons of hay. There were 6,715 horses, 4,897 milch cows, 9,160 other cattle, 89,616 sheep, and 16,800 swine; 2 manufactories of agricultural implements, 15 of carriages and wagons, 1 of machinery, 3 of furniture, 4 tanning and currying establishments, 15 saw mills, and 3 flour mills. Capital, Marion. **XII.** A central county of Indiana, drained by the West fork of White river; area, 360 sq. m.; pop. in 1870, 71,939. It has a nearly level surface and fertile soil. A number of railroads concentrate at the county seat. The chief productions in 1870 were 613,267 bushels of wheat, 1,305,988 of Indian corn, 78,246 of oats, 220,885 of potatoes, 37,439 lbs. of wool, 378,963 of butter, and 17,464 tons of hay. There were 7,483 horses,

6,424 milch cows, 7,705 other cattle, 13,173 sheep, and 27,989 swine. The total number of manufacturing establishments was 740, having a capital of \$8,303,185 and an annual product of \$16,642,105. The principal products were leather, boots and shoes, bricks, carriages, cars, clothing, cooperage, cotton and woollen goods, furniture, iron and hardware, machinery, paper, saddlery and harness, tobacco and cigars, varnish, planed lumber, flour, and pork. Capital, Indianapolis, which is also the capital of the state. **XIII.** A S. central county of Illinois, drained by Skillet fork of Little Wabash river; area, 579 sq. m.; pop. in 1870, 20,622. It has an undulating surface and fertile soil. The Illinois Central and the Ohio and Mississippi railroads intersect it. The chief productions in 1870 were 173,652 bushels of wheat, 1,034,057 of Indian corn, 389,446 of oats, 37,689 of potatoes, 40,285 lbs. of wool, 81,014 of butter, and 21,242 tons of hay. There were 6,695 horses, 4,457 milch cows, 7,027 other cattle, 14,511 sheep, and 21,883 swine; 18 manufactories of carriages, 10 of saddlery and harness, 6 of tin, copper, and sheet-iron ware, 3 of machinery, 9 saw mills, and 11 flour mills. Capital, Salem. **XIV.** A S. central county of Iowa, intersected by the Des Moines river; area, 576 sq. m.; pop. in 1870, 24,436. The surface is undulating, with much prairie, and the soil fertile. The Des Moines Valley railroad passes through it. The chief productions in 1870 were 374,414 bushels of wheat, 2,110,900 of Indian corn, 189,331 of oats, 152,763 of potatoes, 88,820 lbs. of wool, 499,153 of butter, and 21,522 tons of hay. There were 8,975 horses, 7,162 milch cows, 12,322 other cattle, 29,074 sheep, and 41,238 swine; 5 manufactories of carriages and wagons, 2 of woollen goods, 2 flour mills, and 6 saw mills. Capital, Knoxville. **XV.** A N. E. county of Missouri, separated by the Mississippi from Illinois, and drained by North and South Fabius and North Two and South Two rivers; area, 425 sq. m.; pop. in 1870, 23,780, of whom 3,592 were colored. It has an undulating surface, mostly prairie, and a very fertile soil. It is traversed by the Hannibal and St. Joseph, the Quincy, Missouri, and Pacific, and the Toledo, Wabash, and Western railroads. The chief productions in 1870 were 230,822 bushels of wheat, 805,256 of Indian corn, 158,715 of oats, 25,936 of potatoes, 33,438 lbs. of tobacco, 41,481 of wool, 22,700 of butter, and 10,212 tons of hay. There were 6,340 horses, 1,145 mules and asses, 4,306 milch cows, 9,130 other cattle, 14,976 sheep, and 20,019 swine; 1 manufactory of railroad cars, 2 of machinery, 2 of tobacco, 1 of woollen goods, 2 iron foundries, 4 breweries, 11 saw mills, and 4 flour mills. Capital, Palmyra. **XVI.** An E. central county of Kansas, watered by Cottonwood river; area, 1,044 sq. m.; pop. in 1870, 768. It is traversed by the Atchison, Topeka, and Sante Fé railroad. The surface is undulating and the soil fertile. The chief productions in 1870 were

7,722 bushels of wheat, 20,827 of Indian corn, 1,879 of oats, 1,814 of potatoes, 12,745 lbs. of butter, and 3,555 tons of hay. There were 407 horses, 537 milch cows, 2,831 other cattle, 485 sheep, and 291 swine. Capital, Marion Centre. **XVII.** A N. W. county of Oregon, bounded W. by the Willamette river, and watered by the N. Santiam and other streams; area, 2,900 sq. m.; pop. in 1870, 9,965, of whom 127 were Chinese. The E. part is mountainous, bordering on the Cascade range, and here are extensive forests and deposits of gold, silver, coal, and iron; further W. the surface is hilly, while the S. W. portion is a broad and level prairie, with a fertile soil. It is traversed by the Oregon and California railroad. The chief productions in 1870 were 232,091 bushels of wheat, 164,087 of oats, 37,464 of potatoes, 51,169 lbs. of wool, 70,838 of butter, and 3,405 tons of hay. There were 1,707 horses, 1,830 milch cows, 2,133 other cattle, 12,760 sheep, and 6,458 swine; 3 manufacturing of furniture, 1 of linseed oil, 2 of sash, doors, and blinds, 2 of woollen goods, 6 flour mills, and 5 saw mills. Capital, Salem, which is also the capital of the state.

MARION, a town and the capital of Perry co., Alabama, on the Selma, Marion, and Memphis railroad, 60 m. W. by N. of Montgomery; pop. in 1870, 2,646, of whom 1,455 were colored. It has a savings, insurance, and trust company, two weekly newspapers, and a monthly periodical published by the college students, and is the seat of three institutions of learning: Howard college (Baptist), founded in 1837; Judson female institute (Baptist), and Marion female seminary, institutions of collegiate grade founded in 1836. The college has a theological department, and in 1873-'4 had 6 professors, 148 students (40 preparatory, 96 collegiate, and 12 theological), and a library of 1,000 volumes; Judson institute, 12 instructors, 133 students (24 preparatory and 109 collegiate), and a library of 3,000 volumes; Marion seminary, 8 instructors, 127 students (25 preparatory and 102 collegiate), and a library of 1,000 volumes.

MARION, Francis, an American revolutionary officer, born in Win yaw, near Georgetown, S. C., in 1732, died near Eutaw, S. C., Feb. 28, 1795. He was of a Huguenot family which emigrated from France to South Carolina about 1690. He received little education, for which the facilities in his native district were then very slight. In 1759 he was a volunteer in an expedition against the Cherokees, and served in a cavalry troop commanded by one of his six brothers. In 1760 and 1761 he was again in the field on similar expeditions. He led the forlorn hope in the battle of Etchoee, and was one of the few who escaped. In 1775, at the outbreak of the revolution, he was elected to the provincial congress of South Carolina from St. John's parish, Berkeley. In the military organization which ensued, he was made (June 21, 1775) a captain in the

regiment of which William Moultrie was colonel. Marion's company was one of those despatched from Charleston for the capture of the British fort Johnson. The place was taken, and the guns were directed upon the men-of-war in the harbor. The British shipping was completely expelled from the harbor by the cannon from another fort established by Moultrie on Haddrell's point. A fortification at Dorchester was confided to Marion, who was promoted in his regiment. He was soon summoned thence to the defence of the fort begun on Sullivan's island, menaced by a powerful British fleet. It was assailed before it was finished, but the hostile fleet was repelled with great loss. In February, 1777, Marion was despatched with 600 men to the defence of Georgia, where he served at intervals until the British with overwhelming forces had gained possession of the state. Fort Moultrie (Sullivan) was again confided to his charge, and he held this post during Gen. Prevost's attempt at a *coup de main* on Charleston (1779). Subsequently he joined the united French and American forces in the fruitless attack on Savannah. During the siege of Charleston he accidentally broke his leg, and was therefore conveyed with all other invalids out of the city. As he grew able for service, the Carolinas being left almost defenceless, he gathered his neighbors about him and laid the foundation of that brigade which finally became famous for its partisan successes. Meantime Gen. Gates had been despatched by congress to take command of the southern army. At the approach of the continental forces, Marion, then a colonel, joined them in North Carolina; but so wretched were his equipments, and so paltry his numbers, that Gates remarked only the ridicule which they provoked in the camp, and failed to appreciate their patriotism and ability. He despatched Marion on an idle mission to cut up the boats on the rivers to prevent the escape of the British. A few days later Gates was defeated in the battle of Camden (Aug. 16, 1780), while Marion, waylaying the British guards, dispersed them and rescued their continental prisoners. From this period dates the series of adventurous flights, forages, marches, countermarches, and surprises which distinguished the brigade of Marion until the establishment of peace. He kept alive the spirit of patriotism, taught the inexperienced frontiersman to be both bold and vigilant, how to discipline himself, and how to arm and support himself, at a time when the country had no resources for him. In 1780 Marion was promoted to a brigadiership, and his command was termed a brigade whether it numbered 20 or 1,200 men. It is impossible to pursue in detail the progress of so restless and eager a chieftain in a career marked by so great a variety of action and resource. Even popular tradition fails to follow him. His camp at Snow's island, his potato feast to the British

officer, his quiet humor when dealing with both friend and foe, his perpetual vigilance and sudden movements, have all entered into the legends of the country. Though Snow's island, a natural fortress of swamps and forests accessible only under good guidance, was his favorite hiding place, yet he had other retreats in almost every swamp of Carolina, where he found ready refuge from a superior enemy, and whence he could rapidly emerge. His food was chiefly potatoes and corn; his only drink was vinegar and water; for months he slept without a blanket, and marched without a hat; and he trained his followers to his own habit of cheerful endurance. He disciplined in his style of warfare many young officers, who proved in time worthy of their master. In December, 1780, Gen. Greene, superseding Gates, took command of the southern army. He was able to appreciate the courage and services of Marion, who now united his brigade with the main army or acted separately, as the occasion or the wishes of the continental general required. He was Greene's great resource for obtaining intelligence; had his spies in the British camps and garrisons, in Camden, Charleston, Georgetown, and Savannah; and was himself almost ubiquitous with his brigade. He baffled Tarleton, Barfield, Doyley, Gainey, McArthur, Coffin, and Wemyss, all of whom were in turn or in concert despatched for his express capture or defeat. After Cornwallis had driven Greene's army out of the state Marion held his ground, pressed his predatory warfare to the gates of Charleston, and interrupted the line of communication between the metropolis and all parts of the interior. Col. Watson with a picked force was sent to expel or crush him. Major Gainey, of whom great expectations were formed, was also sent in pursuit; yet he was defeated by Marion, narrowly escaping with his life. Col. Tyne, whom Marion had once before defeated, was also on his track, and was again foiled. Major McIlraith, sent with another division to cooperate with Watson, was in close pursuit of him, but he baffled them both, so palpably that McIlraith was disgraced. The next auxiliary of Watson was Col. Doyle, subsequently distinguished as a British general in India. Each took the field with a regiment of British, and a large additional force of loyalists. Unable openly to meet either division, Marion determined to prevent their junction. Watson was led into one ambush after another until, having lost a large part of his men, he reached Georgetown. Marion then turned upon Doyle, who made a precipitate retreat and avoided him. This retreat was in part occasioned by the necessities of Rawdon, who called in his detachments at the approach of Greene. Being joined by Lee's legion and supplied with ammunition, Marion determined to attack Fort Watson on the Santee river. It was on high ground, and as he was without artillery, towers made of logs

were extemporized during the night, and raised sufficiently high to enable the riflemen to plant themselves on an elevation equal to that of the fortress; and while the sharpshooters plied their bullets, a storming party scaled the walls, and the garrison surrendered. Lee then rejoined Greene, but after the battle of Hobkirk's Hill aided Marion in investing Fort Motte on the Congaree. The besiegers again felt the want of artillery, but Mrs. Motte, the original owner of the house around which the fort had been constructed, furnished an Indian bow with arrows, which, tipped with combustibles, set fire to the roof over the heads of the garrison, which then capitulated. Marion distinguished himself by prudence and humanity superior to his times, and prevented Lee's men from hanging some of the prisoners. Some causes of complaint tempted him soon after to resign his commission and join the main army under Washington; but Greene succeeded in dissuading and retaining him, and he was soon repeating his exploits on the skirts of Lord Rawdon's forces, and while holding him in check captured Georgetown. He subsequently joined Greene and Sumter in the pursuit of Rawdon, till he intrenched himself in Orangeburg, and declined battle. After the evacuation of Orangeburg and the departure of Rawdon for Europe, the forces of Marion and Sumter swept the country to the gates of Charleston. He then resumed his independent command in the Santee country, took an important part in the battle of Eutaw Springs (Sept. 8, 1781), and pursued the enemy in their retreat. The British were gradually confined almost to the walls of Charleston, and the legislature of the state again assembled for the purpose of restoring civil authority. Marion steadily refused to engage in any unnecessary enterprise after the prospect of peace. He disbanded his brigade soon after the British fleet and army evacuated Charleston (Dec. 14, 1782), taking a tender farewell of his followers, and returned to the avocations of a farmer almost in poverty. He was subsequently returned to the senate of the state by the electors of St. John's parish, Berkeley. In 1784 he accepted the appointment under the state of commandant of Fort Johnson, and soon after married. In 1790 he was a member of the convention for framing a state constitution, and in 1794 he resigned his commission as one of the generals of the state militia. He was buried at Belle Isle, in the parish of St. John's, and a slight oblong tomb, the tribute of a private citizen, covers the remains of one of the purest men, truest patriots, and most adroit generals that American history can boast.

MARIOTTE, Edme, a French physicist, died May 12, 1684. The date and place of his birth are unknown. He was prior of St. Martin-sur-Beaune, Dijon, and one of the original members of the French academy of sciences. Condorcet says that "Mariotte was the first one in France who introduced into physics a

spirit of observation and doubt, and who inspired that scrupulousness and caution so necessary to those who interrogate nature and interpret her responses." His collected works were published at Leyden in 1717, and at the Hague in 1740, in 2 vols. 4to. They contain papers upon a great variety of subjects in physics and natural philosophy, and are filled with accounts of his numerous and ingenious experiments. His principal discoveries were: 1, the law in regard to gases, usually called Mariotte's law, that, the temperature of a gas remaining fixed, its volume varies inversely as the pressure upon it (see PNEUMATICS); 2, that air exists in liquids, especially in water; 3, that the part of the retina where the optic nerve enters it is insensible to light. He also invented the now common experiment of dropping a coin and a feather in the exhausted receiver of an air pump, to show that both will fall through equal distances in equal times.

MARIPOSA, an E. county of California, drained by the Merced and Mariposa rivers, affluents of the San Joaquin; area, 1,440 sq. m.; pop. in 1870, 4,572, of whom 1,084 were Chinese. The surface is mountainous, the E. part being traversed by the Sierra Nevada; the soil in the W. is of great fertility. Gold abounds throughout the county, being found in nearly every creek and gulch and in quartz veins. Three placers and three quartz mines were in operation in 1870. It contains the Yosemite falls and the Mammoth Tree grove. (See CALIFORNIA.) The chief productions in 1870 were 4,275 bushels of wheat, 8,135 of barley, 1,712 of potatoes, 87,816 lbs. of wool, and 2,499 tons of hay. There were 1,110 horses, 923 milch cows; 6,118 other cattle, 18,442 sheep, and 8,577 swine; 1 iron foundery, 2 breweries, 4 saw mills, and 2 quartz mills. Capital, Mariposa.

MARITZA (anc. *Hebrus*), a large river of Roumelia, European Turkey. It rises on the N. E. flank of the Despoto Dag (anc. *Rhódope*), a branch of the Balkan mountains, flows E. S. E. and S. S. W., and after a course of about 300 m., during which it passes Filibe (Philippopolis) and Adrianople, enters the Grecian archipelago by two mouths.

MARIUS, *Caius*, a Roman soldier, born near Arpinum in 157 B. C., died in Rome in 86. His origin was humble, and his parents are said to have been clients of the Herennii, an eminent plebeian family. That he ever labored for wages may be doubted, and may have been one of the reports invented to injure him by the *optimates*, and accepted by him to make his elevation seem the greater by contrast with his original position. Marius had no third name, or cognomen, nor did he ever win one, notwithstanding his brilliant military services. A passage in Velleius Paterculus, which represents him to be of equestrian birth, is believed to be an error of some transcriber. Plutarch expressly states that his parents were obscure, and that they gained their living by the labor

of their hands. The first mention of him in history is as a soldier in the army with which the second Scipio Africanus besieged Numantia in 134, when he was but 23 years old. His bravery, his sobriety, and the readiness with which he submitted to the severe reforms that Scipio found it necessary to introduce into the Roman army, attracted the attention and won the commendation of that great general. The tradition was, that Marius was so encouraged by Scipio's words, deeming them to form a divine intimation, that he entered on a political career; yet it was not until 15 years later that he achieved his first political success, being then chosen tribune of the people (119). This office he obtained through the influence of Metellus, who belonged to the Cæcilian gens, one of the most distinguished plebeian houses in Rome. He had previously been unanimously elected military tribune. As tribune of the people he introduced a bill calculated to promote the freedom of elections, which was opposed by the *optimates*, then at the height of their power, immediately after the fall of Caius Gracchus; but Marius, by the most vigorous measures, carried his point, though the opposition was headed by his patron, the consul Metellus. He showed his firmness in another way, by opposing a distribution of corn among the people, because he believed it injurious to their interests. He sought the curule ædileship, but was forced to withdraw from the contest; and he was beaten as a candidate for the plebeian ædileship. Elected prætor, his name was the lowest on the list. He was then proceeded against for bribery, but escaped conviction, the votes of his judges being equally divided. He was prætor in 115, but did not leave Italy. As proprætor, the next year, he served in Further Spain, which he is reported to have cleared of robbers. Shortly afterward he married Julia, a sister of the father of Julius Caesar, who belonged to one of the most illustrious of the patrician *gentes*. When Q. Cæcilius Metellus took command of the Roman army employed against Jugurtha (109), Marius became one of his legates, and distinguished himself in the war, being very popular with the common soldiers, and attracted the attention of his countrymen at home. He asked leave of Metellus to go to Rome, that he might offer himself as a candidate for the consulship; but his commander, after first seeking to argue against his supposed unreasonable ambition, and then declaring that he could not be spared from the army, finally refused his request in an insulting manner. Marius then commenced intriguing against Metellus, whom he accused of prolonging the war, which he offered to bring to a prompt conclusion with one half the force then employed against Jugurtha. These things were all known at Rome, where they increased the popularity of Marius. To get rid of an enemy, Metellus granted him the permission he had asked, but only 12 days before the time of election. Arriving at Rome, Marius en-

tered on the contest at once, and became consul in 107, at the age of 50. He did not bear his success with meekness, but made use of the harshest language when speaking of the aristocracy. The province of Numidia was assigned him, which made him the successor of Metellus. In levying soldiers he did not confine himself to the classes whence the legions had formerly been recruited, but enrolled men from the lowest orders, and slaves, which is regarded as the first of those acts through which the Roman armies were led finally to look for law more to their commanders than to the state. He led his new levies to Africa, where he vigorously waged the war against Jugurtha until the latter took refuge with Bocchus, king of Mauritania, who betrayed him to Sulla, the quaestor of Marius (106). This caused Sulla to claim the merit of having closed the war, and so laid the foundation of a personal quarrel destined to have memorable consequences. Marius remained two years longer in Numidia, bringing the country into order and establishing the Roman government there. While thus engaged, he was elected consul without opposition, the approach of the Teutons and Cimbri and the Ambrones, who had destroyed several Roman armies, having caused great fear in Italy, and drawn all men's minds to the conclusion that power could be intrusted to no one but the conqueror of Numidia. His Jugurthine triumph took place Jan. 1, 104, the first day of his second consulship. Jugurtha walked in the procession, and afterward was thrown into a dungeon and starved to death. The barbarians not appearing in Italy, Marius employed the time in effecting reforms in the army, and in disciplining the newly raised troops. His discipline was severe, but the impartiality of his conduct made him a favorite with the men, who had the utmost confidence in his ability and good fortune. He was chosen consul a third time for the year 103. The enemy still remaining in Spain, the aristocratic party determined to oppose his reelection; but the people supported him, and he was elevated a fourth time. This year he encountered the Teutons and Ambrones in Gaul, totally destroying them in a great battle fought near Aquæ Sextiæ, the modern Aix. Just after the battle Marius received news that he had been elected consul for the fifth time. Meantime the Cimbri, who had separated from their allies, had penetrated into Italy, where the terror of their name caused the army of Catulus, the other consul, to fly before them. Marius was recalled to Rome. Refusing the triumph offered him by the senate until the Cimbri should be conquered, he joined the army of Catulus, with which the troops who had conquered the Teutons were now united. On July 30, 101, the Cimbri were annihilated in a pitched battle, fought on a plain called the Campi Raudii, near Vercellæ, the modern Vercelli. The victory was really due to Marius, though his enemies sought to give the credit

of it to Catulus, who was then proconsul; but the Romans were so convinced that they owed their deliverance to the consul, that among other high honors they gave him the title of third founder of the state, thus ranking him with Romulus and Camillus. His triumph was brilliant, and Catulus was allowed to share in it. For the sixth time he was chosen consul; but the good fortune which he had experienced in the field deserted him in the city, where his ignorance of civil life led him into various mistakes, which caused his popularity to decline as rapidly as it had risen. The aristocracy artfully placed him in opposition to the tribune Saturninus, who was his instrument and associate, and whom he had to proceed against to the tribune's ruin and death. He entrapped his old enemy Metellus into a position that caused him to be banished. So low had Marius sunk by the time his sixth consulship was drawing to a close, that he durst not become a candidate for the censorship. The next year (99) he visited Asia, where he sought to rouse Mithridates to make war on Rome, being confident that he should recover his popularity when once more placed at the head of an army. He was chosen augur during his absence. After his return to Rome, he did not rise in popular esteem; he could obtain no command in the East, and Sulla, who had supplanted him in the popular favor, exasperated him by his conduct. The Mauritanian king had set up in the capitol figures showing the surrender of Jugurtha to Sulla. Marius was making preparations to pull down these figures, and Sulla to resist him, when, in 90, the social or Marsic war broke out, which threatened the subversion of the Roman power in Italy. Both Marius and Sulla had to contend against the confederate Italians in the social war, and both did so with success. It was thought, however, that the exploits of Sulla were the more striking, but it is certain that Marius twice defeated the Marsi, the most warlike of all the allies, and whose name furnished to the Romans a title for the war. He returned to Rome after these victories, avowedly because of his inability to encounter the fatigues of the service. He was 67 years old, and had grown fat and unwieldy. After this war had been finished, the rivalry of Marius and Sulla was resumed. War against Mithridates having been commenced, Marius sought the command in the East. He frequented the Campus Martius, and went through exercises appropriate to the young, in order to show that he was equal to the fatigues of war. He failed, and Sulla was appointed to the office he sought (88). Marius now procured the passage of a law to distribute the Italian allies, who had been admitted to the Roman franchise, among all the tribes, so that they should control the old citizens. His tool was P. Sulpicius Rufus, a tribune, and he was successful, though not without having resort to violence. The Italians then conferred the eastern command upon Marius; but Sulla, who

had joined the army destined to act against Mithridates, incited it to resistance, marched to Rome, and compelled Marius and his friends to fly, they having no force to send against him. Marius vainly endeavored to raise an army by offering freedom to all slaves who should join him. He then sought to reach Africa, but was compelled by bad weather and want of provisions to land in Italy, near which he was coasting. Taking refuge in a wood, and suffering from cold and hunger, he predicted that he should yet receive a seventh consulship. He told his companions that in his childhood a nest with seven eaglets in it had fallen into his lap, and that the soothsayers had prophesied to his parents that he should seven times enjoy supreme power. Flying from immediate pursuit, he and his company were forced to swim to two merchant vessels, the crews of which refused to give them up, but afterward made them land at the mouth of the Liris. Here, while concealed in a marsh, Marius was found by his pursuers, and imprisoned at Minturnæ. A Cimbric soldier was ordered to despatch him, but was so affected by the old man's look and language that he lost courage, and declared that he could not kill Caius Marius. The people of the town rose in his favor, and furnished him with a vessel, in which he sailed to Africa, meeting with many dangers on the way. He landed at Carthage, where a message was sent him by the Roman prætor, ordering him to leave the country. His answer was: "Tell the prætor that you have seen Caius Marius a fugitive sitting on the ruins of Carthage;" a reply, says Plutarch, in which he not inaptly compared the fate of that city and his own changed fortunes. He was soon compelled to leave, and went with his son to the island of Cereina. Meantime a revolution had taken place in Italy, where the consul Cinna, who was of the Marian party, had placed himself in opposition to the Sullan faction, headed by his colleague Octavius. The latter, after a severe struggle, expelled Cinna from Rome, who raised a large army, composed of the new citizens. Marius, on hearing of this, returned to Italy, and on landing proclaimed freedom to the slaves, and sent to Cinna, offering to obey him as consul. Cinna accepted the offer, and named him proconsul. This office Marius would not accept, saying its title and insignia were not suited to one in his state. One idea, that of vengeance, alone had possession of his mind. Rome was soon compelled to surrender to the army headed by Cinna and Marius. The former was disposed to proceed mildly, but Marius had other intentions. At first he refused to enter the city until the comitia repealed the law under which he had been banished; but while the voting for that purpose was going on, he entered at the head of his guards, who were composed of the slaves by whom he had been joined, and an immediate massacre of the anti-Marians was begun. The slaughter

was continued for several days, and among its victims were many of the noblest of the Romans. Cinna and Marius declared themselves consuls for the next year, 86. But though Marius had thus irregularly obtained his seventh consulship, he did not long enjoy it, dying on its 18th day, from illness brought on by age, fatigue, and care. The statement that his mind was disordered by fear of Sulla's return is probably one of the libels of the Sullan party. After the triumph of Sulla, the ashes of Marius were thrown into the Anio, by order of the victor. The representative and leader, though perhaps not in strictness the founder, of the party which bears his name in the subsequent history of the Roman republic, and which he was clearly incompetent to conduct to success, his character has probably suffered, like that of other party chiefs, at the hands of his enemies. No Roman ever rendered greater services to the state, and no Roman ever rose so high, to fall so low, with the single exception of Pompey, who in the next generation headed the opposite party.

MARIVAUX, Pierre Carlet de Chamblain de, a French author, born in Paris in 1688, died there, Feb. 12, 1763. He wrote about 30 comedies, the greater part for the Italian theatre, and now seldom performed. Among the best are *Le jeu de l'amour et du hasard*, the author's dramatic masterpiece, and *Les fausses confidences*. He is now known chiefly by his romances, *La vie de Mariane* and *Le paysan parvenu*. He also wrote *Le spectateur françois* and *Le philosophe indigent*, distinguished by an eccentric and affected style, called after him *marivaudage*. He was elected a member of the French academy in 1743, Voltaire being a rival candidate.

MARJORAM, the common name of plants of the genus *origanum*, in the natural order *labiate*, having nearly entire leaves and purplish or whitish flowers crowded in cylindrical or oblong spikes, which are imbricated with frequently colored bracts. About 25 species are enumerated, of which the most common in the gardens is the sweet marjoram (*O. majorana*), native of Barbary and middle Asia. It is a clean, pretty, low, bushy plant, usually treated as an annual, but properly a perennial. The fragrant leaves and buds, being carefully dried, are pulverized by rubbing them in the hands, and are employed by cooks as a seasoning for forced-meat balls, stuffing, soups, &c. On account of the compact clusters or heads, it is in some localities known as knotted marjoram. The wild marjoram (*O. vulgare*) has become sparingly naturalized in the United States, adventitiously introduced from Europe. It can be found occasionally upon dry banks and sunny slopes. Its flowers are very pretty, appearing in the months of July and August. Essential oils may be extracted from either of the species mentioned above, but the oil which is now known in commerce as oil of *origanum* has been shown to be really derived from the *thymus*

vulgaris, a mint growing in the south of France. This is sometimes used as an external irritant, especially in veterinary practice, and, like many



Marjoram.

other volatile oils, will allay toothache when introduced into a carious cavity. Internally it is a stimulant, but has no great value.

MARK, Saint, the evangelist, according to the opinion of most theologians, identical with John Mark, mentioned in the Acts (xii. 12, 25). By comparing the passages of the New Testament relating to both Mark and John Mark, we learn the following facts of his life. He was the son of a certain Mary, who possessed a house at Jerusalem which served the Christians as a place of refuge. About the time when James the Elder was executed, he left Jerusalem with Paul and Barnabas, his kinsman (A. D. 42), went to Antioch, and from there to Cyprus and Asia Minor, but separated from them at Perga, in order to return to Jerusalem. Paul blamed this conduct; and when later Barnabas proposed to take Mark along on a new missionary tour, Paul objected, and Barnabas and Mark undertook a journey of their own. But we find him again as a friend and fellow laborer of Paul during the first captivity of the latter. It appears that both intended, after the end of the captivity, to visit the Christians of Asia Minor. Mark probably executed this design, for Paul requests Timothy (2 Tim. iv. 11) to bring Mark to Rome. He was with the apostle Peter, near Babylon (which, according to many interpreters, designates Rome), when that apostle wrote his first epistle. According to the testimony of the ancient church, Mark was in a particularly intimate relation to the apostle Peter, who employed him as secretary in the same way as Titus was employed by Paul. After the death of Peter, Mark is said to have gone to Egypt, and especially to Alexandria, to have collected congregations there and in the

neighborhood, to have been the first bishop of Alexandria, and, finally, to have suffered martyrdom there. He is the patron saint of Venice, which city claims to possess his body. His festival is celebrated in the Roman Catholic church on April 25.—The Gospel of Mark is distinguished from the three others by being more exclusively historical, and excluding longer didactic portions, such as the sermon on the mount. All the facts recorded in it may be found also in Matthew or Luke, and only 27 verses belong exclusively to Mark; a circumstance which has given rise to wide differences of opinion concerning the position of Mark in relation to the other two. Augustine advanced the opinion that Matthew wrote first, that Mark wrote an abridgment of the Gospel of Matthew, and that Luke in writing his Gospel made use of both Matthew and Mark. This view continued to prevail among exegetical writers until the 18th century, when the question of priority of composition among the three synoptic Gospels (Matthew, Mark, and Luke) became the subject of vehement controversy, every possible combination finding its defenders. Eichhorn in 1794 advanced the theory that all the three synoptic Gospels of our canon had made use of a primitive Gospel (*Ur-Evangelium*), no longer extant. Many German critics assume a primitive Gospel of Mark (*Ur-Markus*), of which the Gospel in our canon is a revised and enlarged copy. Among the prominent defenders of this view are Ewald (1849), Scholten (1867), Volkmar (1870), and Weiss (1872). Others have advanced similar views with regard to Matthew and Luke. Most of these writers agree in regarding the Gospel of Luke as the latest of the synoptic Gospels in their present form; the most notable exception being Keim, who (in his "Life of Jesus") maintains that the Gospel of Mark is the latest of the three. The defenders of the originality of the Gospel of Mark in its present form generally place the time of its compilation between the death of the apostles Peter and Paul and the destruction of Jerusalem. Rome is almost unanimously regarded as the place where it was written. The evangelist undoubtedly used the Greek language; a note to the Syrian translation, stating that the Gospel was compiled in Latin, received for a time wide currency among Roman Catholic scholars through the support of Baronius, but it has been almost entirely discarded since the time of Richard Simon. Doubts are entertained also by prominent theologians of the orthodox school whether the last 12 verses are by Mark, or were added after his death; in support of the latter view it is adduced that Jerome, Gregory of Nyssa, and other fathers expressly mention that the Gospel closed with the words, "For they were afraid" (xvi. 8); in favor of the other, that all the Latin and Syrian manuscripts have these verses.—For commentaries on Mark, see the collective works on the Gospels mentioned in the article LUKE. Commentaries on Mark

alone have been published, among others, by J. A. Alexander (New York, 1858), Klostermann, *Das Markus-Evangelium* (Göttingen, 1868), and Weiss, *Das Markus-Evangelium und seine synoptischen Parallelen* (Berlin, 1872). Accounts of the modern discussions about the origin and history of the Gospel of Mark may be found in Wilke, *Der Urevangelist* (Leipzig, 1838), F. C. Baur, *Das Markus-Evangelium* (Tübingen, 1851), and in the commentaries of Klostermann and Weiss. A full account of the literature on the subject is given by Sevin in *Erklärung der drei ersten Evangelien* (Wiesbaden, 1873).

MARK ANTONY. See **ANTONY.**

MARKHAM, Clements Robert, an English geographer, born at Stillingfleet, near York, July 20, 1830. He was educated at Westminster school, and entered the navy in 1844. In 1846 he was appointed naval cadet on board a vessel on the Pacific station, and, having passed for a lieutenant, left the navy in 1851. In 1850-'51 he served in the expedition in search of Sir John Franklin, and in 1852-'4 explored the forests of the eastern Andes. In 1855 he became clerk in the board of control, and in 1858 secretary of the Hakluyt society. Between 1859 and 1866 he again went to Peru and twice visited India, where he introduced the cultivation of the cinchona tree. In 1863 he was made secretary of the royal geographical society, and in 1867 assistant secretary in the India office, receiving charge of its geographical department in 1868. In the latter year he was appointed geographer to the Abyssinian expedition, and was present at the storming of Magdala. Besides many translations for the Hakluyt society and papers in the journal of the royal geographical society, he has published "Franklin's Footsteps" (1852); "Cuzco and Lima" (1856); "Travels in Peru and India" (1862); "Quichua Grammar and Dictionary" (1863); "Spanish Irrigation" (1867); "History of the Abyssinian Expedition" (1869); "Life of the Great Lord Fairfax" (1870); "Ollanta, a Quichua Drama" (1871); "Mémorial on the Indian Surveys" (1871); a translation, printed by the Hakluyt society, of the "Reports on the Conquest of Peru" (1872); "The Threshold of the Unknown Regions" (1873); and a "General Sketch of the History of Persia" (1874). He is the editor of the "Geographical Magazine."

MARKIRCH, or *Mariakirch* (Fr. *Ste. Marie-aux-Mines*), a town of Alsace-Lorraine, Germany, 22 m. N. W. of Colmar; pop. in 1871, 12,319. It is one of the most flourishing centres of Alsatian industry. Among the principal branches of manufacture are silk, wool, and cotton weaving, dyeing, and bleaching. The valley of Markirch is one of the most picturesque of Alsace. There are lead and copper mines in the neighboring mountains. The town is of recent origin.

MARL, a clay containing a large proportion of carbonate of lime, sometimes 40 to 50 per

cent. If the marl consists largely of shells or fragments of shells, it is called shell marl. In New Jersey the layers of greensand are very generally known as marl beds, a name more correctly applied to the tertiary beds made up of marine fossil shells which are found near the coast of the middle and southern states, and are employed for fertilizing the soil. In the northern states rich marl deposits are often found at the bottom of ponds, in the form of a thin white mud filled with minute fresh-water shells of living species. (See **GREENSAND**.)

MARLBOROUGH, a N. E. county of South Carolina, bordering on North Carolina, bounded W. by the Great Pedee river, and watered by its affluents; area, 505 sq. m.; pop. in 1870, 11,814, of whom 6,668 were colored. The surface is level and the soil productive. The chief productions in 1870 were 6,321 bushels of wheat, 158,088 of Indian corn, 20,748 of oats, 17,894 of peas and beans, 42,356 of sweet potatoes, 17,677 lbs. of rice, and 8,843 bales of cotton. There were 916 horses, 919 mules and asses, 1,637 milch cows, 2,907 other cattle, 974 sheep, and 8,370 swine. Capital, Bennettsville.

MARLBOROUGH, a town of Middlesex co., Massachusetts, on a branch of the Fitchburg railroad, and on the Boston, Clinton, and Fitchburg railroad, 25 m. W. of Boston, and 15 m. E. N. E. of Worcester; pop. in 1870, 8,474. It is built on numerous hills, and contains within its limits Lake Williams, a beautiful sheet of water covering 160 acres. It has a handsome soldiers' monument of granite, a brick town hall costing \$87,000, three hotels, gas works, and a good fire department. There are 25 boot and shoe manufactories, of which several are very extensive; a national bank, a savings bank, a high school, 36 public schools, four evening schools, five private schools, a public library of 5,000 volumes, two weekly newspapers, and seven churches. Marlborough was incorporated in 1661.

MARLBOROUGH, a town and parliamentary borough of Wiltshire, England, on the Kennet river, 75 m. W. by S. of London; pop. in 1871, 5,034. It consists chiefly of one wide street. There is a royal free grammar school, founded by Edward VI. A castle existed in the days of Richard I., and a parliament was held there under Henry III., passing laws which were known as the statutes of Malbridge or Marlberge. The site was subsequently occupied by a noble mansion, at a later period by an inn, and is now part of Marlborough college. This institution dates from 1843, and is intended for 500 pupils, two thirds of whom must be sons of clergymen. A laboratory and science lecture room were established in 1875. The town has considerable trade in local manufacturing, agricultural, and dairy products, but has lost the importance which it had before the opening of the Great Western railway, when it was one of the principal posting stations between London, Bath, and Bristol.

MARLBOROUGH, John Churchill, duke of, a British general, born at Ashe, in Devonshire, June 24, 1650, died in London, June 16, 1722. He was the son of Sir Winston Churchill, a royalist of some note, who procured for him the place of page to the duke of York, shortly after the restoration. His education was slight, but he was a favorite with the duke, who made him an ensign in the guards at the age of 16. He served at Tangiers against the Moors, and in the auxiliary force which Charles II. sent to aid the French in their attack on Holland, where he won the praise of Turenne by his courage and capacity. Louis XIV. made him a colonel, and on his return to England after the peace of Nimeguen the duke of York gave him high appointments in his household. He owed his advancement as much to the influence of his sister Arabella as to his own merits, she being the mistress of the duke of York. He was engaged in not a few intrigues of gallantry, and is said to have jumped from the window of the chamber of the duchess of Cleveland, one of the most notorious of the king's mistresses, to avoid the king. The lady rewarded him by the present of £5,000, with which he purchased an annuity of £500 a year. In 1678 he married Sarah Jennings, a young woman of good family, in the service of the duchess of York, who became famous for her talents and imperious temper. He received military promotion, and was made Lord Churchill in the peerage of Scotland; and soon after, on the marriage of the princess Anne with Prince George of Denmark (1683), Lady Churchill was made chief lady of her bedchamber. The ladies had been friends for some time, though no two persons could be more unlike; Anne being as dull, heavy, and yielding as Sarah was lively, changeable, and imperious. They corresponded, when unavoidably separated, under the names of Mrs. Morley and Mrs. Freeman. The influence thus established lasted for more than a quarter of a century, and would have ended only with Anne's life if Lady Churchill had known how to govern her temper. On the duke of York becoming James II., Churchill was made general and baron of Sandridge, and was sent as ambassador to France. On the rebellion of the duke of Monmouth, he performed important military services, and the victory of Sedgemoor was due to him. He was not conspicuous during the reign of James II., and was opposed to the policy of that prince; but his opposition was not of a demonstrative character, and down to the last moment he enjoyed the king's confidence. The influence of his wife over Anne was used with effect to keep the princess opposed to her father's policy, and in 1687 Churchill communicated that fact to William of Orange. On the landing of William, Churchill was made a lieutenant general, and appointed to an important command. He induced Lord Cornbury, son of the earl of Clarendon and brother-in-law of

James, to join William, and soon followed him, accompanied by several military men, and by the duke of Grafton, an illegitimate son of Charles II. His example was followed by Prince George of Denmark, while Lady Churchill found no difficulty in persuading Anne to leave London, and to join the northern insurgents. The influence of the Churchills was employed to induce Anne to waive her superior claim to the throne over William. For this Lord Churchill received valuable appointments, and was made earl of Marlborough. In the subsequent disputes between William and Anne he sided with the latter. He was sent in 1689 to command the British forces in the Low Countries, and repulsed the French at Walcourt. The next year he led an army to Ireland, and took Cork and Kinsale. He early began a correspondence with the exiled king, and completely deceived him. His object was not to aid James, but to overthrow William III., place Anne at the head of the nation, and rule her and England through his wife. In 1692 he was dismissed from his employments, and sent to the tower, where he remained for some time. He sent to James an account of the expedition against Brest, which enabled the French to defeat the English with great slaughter, one of his objects being to ruin Talmash, a military rival, who lost his life on the occasion. After the death of Queen Mary, Marlborough was restored to favor, and made governor to the duke of Gloucester, Anne's son. At the beginning of the war of the Spanish succession he was appointed commander of the forces in Holland, and ambassador to that country. He was very successful as a diplomatist, and the king, in anticipation of his death, recommended him to Anne as one most competent to advise and command. When Anne became queen regnant (1702), Marlborough was made captain general and master of the ordnance, and a knight of the garter. Lady Marlborough received several valuable appointments in the royal household, and two of her daughters were made ladies of the bedchamber. Through his own influence with Godolphin, the prime minister, who was his son-in-law, and that of his wife with the queen, Marlborough now practically ruled the kingdom. As ambassador to Holland, he completed the arrangements for the declaration of war against France, and was appointed generalissimo of the armies of the grand alliance, when he entered upon a surprising career of victory. After various successes, the campaign of Blenheim, in coöperation with Prince Eugene, took place in the summer of 1704, and on Aug. 13 the battle of that name was won. He had previously been made a duke, and now the manor and honor of Woodstock were conferred upon him, and the queen ordered that a palace should be there built for him, to be called Blenheim. He was successful in the operations of 1705, when the German emperor conferred

upon him the lordship of Mindelheim, with the title of prince. The battle of Ramillies was won May 23, 1706. Other successes marked this campaign, and the duke received a pension of £5,000, and other rewards. The campaign of 1707 was marked by no striking event where Marlborough commanded; but on July 11, 1708, he won the battle of Oudenarde. Lille was taken the same year. Efforts to restore peace having failed, the war was resumed, and on Sept. 11, 1709, Marlborough, aided by Eugene, won the battle of Malplaquet, the most sanguinary and hardly contested of all his victories. His last campaign, in 1711, when he captured the fortress of Bouchain, was the most brilliant and effective of all. In the mean time great changes had taken place in England. The war had been commenced by a tory ministry, though it was to support whig views. Gradually everything changed. Godolphin became a whig, and the great offices passed into whig hands. In 1707 the change was complete, though the queen's sympathies were with the tories. The duchess of Marlborough, who was a whig at the time her husband was a tory, bent all her energies to the support of the ministry, and if her tact had equalled her talent that ministry might have lasted through the queen's life. But the queen at length became weary of her imperious sway, and Mrs. Masham, a cousin of the duchess, whom she had placed in the service of the queen, was used by Robert Harley as a tool to effect her downfall. The ministry of Godolphin was overthrown (1710), the duchess was dismissed, and Harley, as earl of Oxford, became the head of a tory cabinet (1711). This was followed by the removal of Marlborough from all his offices (Jan. 1, 1712). It was even intended to proceed against him legally on a charge of embezzling the public money. Government ceased to pay the cost of building Blenheim, and that palace was completed out of the funds of the duke. The German government treated him with equal ingratitude, as his principality had been lost through the restoration of the elector of Bavaria. At the close of 1712 he left England, and visited Flanders and Germany, residing principally at Aix-la-Chapelle, Frankfurt, and Antwerp. The ill treatment he had received from the tories caused him to become a firm friend of the Hanoverian succession. He corresponded with the elector, offered him a large loan, and used his influence with Holland in behalf of the Protestant succession. He returned to England on the very day of the accession of the house of Hanover, and was well received by the people, the nobility, and the army. He was appointed a privy councillor, and on the arrival of George I. was made captain general of the army and master of the ordnance. He was prompt in his measures during the rebellion of 1715; but it is said that he sent money to the pretender. His health was now on the decline, and he experienced more than one par-

alytic shock. Still his mental powers were not affected. He attended parliament even in the last year of his life, and also performed his various military duties. He offered to resign his offices, but the king would not hear of it. He was seized with palsy in June, 1722, at Windsor lodge, and died eight days before the completion of his 72d year. He had a magnificent funeral, and his body was deposited in Westminster abbey, whence it was removed to Blenheim, and placed in a noble mausoleum, the work of Rysbrack. The duke left no son, and his title passed to his eldest daughter, Henrietta, countess of Godolphin, from whom it descended to her nephew, Charles Spencer, earl of Sunderland. He left enormous wealth, his income at the time of his death being £70,000, exclusive of what he drew from royal gifts. He was doubtless the most adroit statesman and most successful commander of his time.—The duchess survived him 22 years. Though there is much exaggeration in the ordinary accounts of her violence and quarrels, it is undeniable that her life was not of that dignified character which would have been becoming in one of her station. She could be liberal, and aided Child, the banker, whom the bank of England was seeking to ruin, by giving him an order on that institution for £100,000. She gave Hooke £5,000 for assisting to write her "Account" of her conduct while at court. She died Oct. 18, 1744, in her 85th year. Her immense wealth was left principally to Charles, duke of Marlborough, and to his brother, John Spencer. Among her bequests was one of £20,000 to Lord Chesterfield, and another of £10,000 to the elder Pitt.—In 1845-'6 the "Letters and Despatches of the Duke of Marlborough" were published in 5 vols. 8vo, edited by Sir George Murray. The best biographies of the duke of Marlborough are by Cox, "Memoirs of John, Duke of Marlborough" (3 vols. 4to, London, 1817-'19, and 3 vols. 8vo, 1848), and Alison, "Life of John, Duke of Marlborough" (2 vols., London, 1847). The "Life of the Duchess of Marlborough" has been written by Mrs. A. T. Thomson (2 vols., London, 1839), and by Miss Costello, in vol. iv. of "Eminent Englishwomen" (1844).

MARLIANI, Aurelio, count, an Italian composer, born in Lombardy about 1803, killed in Bologna in June, 1849. He joined the carbonari, lost his fortune in their service, and was obliged to take refuge in Paris. There he became a teacher of singing, and Julia Grisi was his pupil. After the revolution of 1848 he returned to Italy, and took up arms with the revolutionists. He composed many songs and romances and several operas, the best known of which, *Le bravo*, was produced at Paris in 1834 and at Vienna in 1835.

MARLITT, E. See JOHN, EUGENIE.

MARLOWE, Christopher, or Kit, an English dramatic poet, born in Canterbury in 1564, killed in Deptford, June 16, 1593. His father, a shoemaker, obtained for him admission into

King's school, Canterbury. He was afterward entered as a pensioner of Corpus Christi college, Cambridge, where he received the degree of bachelor of arts in 1583 and of master in 1587. In 1586 he produced the first part of his tragedy of "Tamburlaine," which exhibits more action on the stage, a more dramatic dialogue, and a far more varied and skilful versification, than any English play which had preceded it; but it was ridiculed for its bombastic style and extravagant scenes. It was printed with a second part in 1590. His second play was the "Tragical History of the Life and Death of Dr. Faustus," a powerful though irregular drama, its poetical beauties being often intermingled with low buffooneries. The hero makes a pact with Lucifer, to whom he disposes of his soul on condition of having a familiar spirit and unlimited power at his command for 24 years. The awful melancholy of the fiend, as contrasted with the malignant mirth of Goethe's Mephistopheles, the struggles of awakened conscience in the hero, and the splendid horror of the termination, are its most striking features. The German puppet play constructed from this drama was the foundation of Goethe's great tragedy, which consequently in the opening has a striking resemblance to Marlowe's. "The Jew of Malta" has more vigorous passages than are to be found in any other Elizabethan play except those of Shakespeare. His "Edward II." contains a death scene which Charles Lamb says "moves pity and terror beyond any scene, ancient or modern." Several other plays of doubtful authorship have been attributed to him, and it is probable that the second and third parts of Henry VI. in Shakespeare were mostly written by Marlowe. He also made translations from Ovid, so licentious that the archbishop of Canterbury ordered them to be burned, yet they have been often reprinted. He is supposed to have been an actor as well as playwright, led a dissipated life, is stated to have held atheistical opinions, though there is no proof of this in his plays, and died from a wound received in a disgraceful quarrel. An edition of his works by Alexander Dyce was published in London in 1850, in 3 vols.

MARMARA, Sea of. See MARMORA.

MÁRMAROS, a N. E. county of Hungary, bordering on Galicia, Bukowina, and Transylvania, and the counties of Bereg, Ugoesa, and Szatmár; area, 3,998 sq. m.; pop. in 1870, 220,506, including about 100,000 Ruthenians, 50,000 Wallachs, 20,000 Jews, 15,000 Magyars, and 3,000 Germans. The United Greek church is the most numerous, there being only about 15,000 Roman Catholics and 6,000 Protestants. Mármaros is next to Bihar and Pesth the largest county of Hungary, but far more thinly populated. The Carpathians separate it from Galicia, Bukowina, and Transylvania, and traverse it in many directions, the highest peaks rising to an altitude of 7,000 ft. At the foot of Mt. Csorna rises the Black Theiss, which

joins the White Theiss in this county. Iron, lead, marble, alabaster, coal, and crystals are found, and in a few localities also gold. The Mármaros diamonds are celebrated. The salt mines are immense. The Suliguli is the most important of the mineral springs. The forests are rich in wood, especially oak. Horses and sheep are raised in great numbers. Excepting the limited valley of the Theiss, the country does not favor the production of cereals, fruits, and wine, and maize is the principal grain raised for local consumption. Capital, Sziget.

MARMIER, Xavier, a French author, born at Pontarlier, June 24, 1809. He studied the German and other foreign languages, and became editor of the *Revue Germanique*. From 1836 to 1838 he explored northern Europe, on board of a national ship of war, and was professor at Rennes from 1839 to 1841, when he received the appointment of librarian in the ministry of education, which permitted him to travel in the East, in North and South America, and in other countries. In 1846 he was placed in charge of the Ste. Geneviève library, and in 1870 was elected to the academy. He has translated Goethe's and Schiller's plays and other German works, and published miscellaneous writings, some of which relate to the history, language, and literature of Iceland, Denmark, and Sweden. His best novels, *Les fiancés du Spitzberg* (Paris, 1858) and *Gazida* (1860), received academical prizes. Among his books of travel are: *Lettres sur le Nord, Danemark, Suède, Laponie, Spitzberg* (1840; 5th ed., 1847); *Du Rhin au Nil* (2 vols., 1847); *Lettres sur la Russie, la Finlande et la Pologne* (2 vols., 1848); *Lettres sur l'Amérique* (2 vols., 1852); *Lettres sur l'Adriatique et le Monténégro* (2 vols., 1854); *Voyage pittoresque en Allemagne* (2 vols., 1858-9); *En Amérique et en Europe* (1859); and *Souvenirs d'un voyageur* (1867). Among his more recent publications is the story book, *L'Arbre de Noël* (1871).

MARMONT, Auguste Frédéric Louis Viesse de, duke of Ragusa, a marshal of France, born in Châtillon-sur-Seine, July 20, 1774, died in Venice, Feb. 28, 1852. He was descended from an ancient family, and at 15 years of age entered a regiment of infantry as sub-lieutenant. Three years afterward he was transferred to the artillery; and having fallen under the notice of Bonaparte, he was in 1796 appointed his first aide-de-camp, in which capacity he served with distinction in the two Italian campaigns. He accompanied the expedition to Egypt, and for his good conduct at the investment of Malta was appointed a general of brigade. He returned with Bonaparte to France, and for his coöperation on the 18th Brumaire was appointed commander-in-chief of the artillery in the army of reserve. The successful transportation of the French artillery over the Great St. Bernard in the spring of 1800 was in a great measure due to his exertions; and the skill with which he managed his batteries at Marengo procured him the rank of general of

division. He participated with credit in the campaign of 1805 in Germany, and in 1806 was made commander-in-chief of the forces in Dalmatia, where he remained till 1809. For his successful defence of Ragusa against a greatly superior force of Russians and Montenegrins, Sept. 30, 1806, he subsequently received the title of duke of Ragusa. After the battle of Aspern and Essling (May 21, 22, 1809) he brought up his corps in good order to the assistance of the emperor, defeating on the way superior bodies of Austrians in several encounters; and for his conduct at the battle of Wagram and in the subsequent pursuit of the enemy, he was created a marshal of the empire. In 1811 he was sent to relieve Masséna in Portugal, and he ended a series of unfortunate movements by losing the battle of Salamanca, which ruined the French cause in the Peninsula. Having recovered from a severe wound received on this occasion, he joined the emperor in Germany in 1813, and fought at Lützen, Bautzen, Dresden, and Leipsic, with a valor which in some degree retrieved his military reputation. In the campaign of 1814 he vigorously cooperated with Napoleon in the brilliant but useless series of battles by which the advance of the allies was sought to be stayed, and on March 29 arrived with the remnant of his corps before Paris. At the battle of Paris, fought on the succeeding day, he showed the utmost intrepidity and devotion to the imperial cause, and, with the few thousand men composing his own corps and that of Marshal Mortier, withstood for many hours the attacks of an army four times as numerous. An armistice was finally agreed upon, and late in the day Marmont, availing himself of a letter from Joseph Bonaparte, who had been appointed lieutenant general of the empire, authorizing him to enter into an arrangement with the allied sovereigns, agreed to evacuate the city. On the 31st the allies entered Paris in triumph; and four days afterward Marmont, influenced by a *senatus consultum* declaring Napoleon's forfeiture of the throne, and abolishing the right of succession of his family, gave in his adhesion to the provisional government which had been formed under the presidency of Talleyrand; stipulating, however, that the life and personal freedom of Napoleon should be secured, and that the French troops should be provided with secure quarters in Normandy. On April 5 his corps, numbering 12,000 men, accordingly entered within the allied lines and took the road to Normandy. The indignation of Napoleon at this proceeding was boundless, and, in an order issued from Fontainebleau immediately after the news reached him, he expressly disavowed it, observing: "The emperor cannot approve the condition on which the duke of Ragusa has taken this step; he cannot accept life and liberty at the mercy of a subject." During the hundred days he expressly excepted him from the imperial act of amnesty, and subsequently

at St. Helena, speaking of his defection, said: "I was betrayed by Marmont, whom I might call my son, my offspring, my own work." He received numerous distinctions from the Bourbons after the first and second restorations, but about 1825 retired to his country seat, whence, in July, 1830, he was suddenly summoned to Paris to quell the revolt against Charles X. Failing in this, he was obliged to share the exile of the Bourbons; and so strong was the odium excited against him, that his name was struck from the list of the French army. He never reentered France, but wandered over Europe, fixing his residence finally at Venice, where his latter years were passed. He published his travels in Hungary, southern Russia, Syria, Egypt, &c., and *Esprit des institutions militaires*, which Marshal Bugeaud wished to place in the hands of every officer in the service; and left an autobiography, published in Paris under the title of *Mémoires du duc de Raguse* (9 vols., 1856).

MARMONTEL, Jean François, a French author, born at Bort, Limousin, July 11, 1723, died at Ableville, near Evreux, Dec. 31, 1799. Of humble birth, he was educated gratuitously under the Jesuits of Mauriac, and was intended for the priesthood. His love of literature prevented this career, and also withdrew him from commerce, in which his father sought his establishment, and he became professor of philosophy at Toulouse, where his verses took the prize of the floral games. Voltaire, with whom he began a correspondence, induced him to remove to Paris in 1745, where he soon obtained the prize of the French academy for a poem, and produced several tragedies which the genius of Mlle. Clairon made eminently successful on the stage. Protected by Mme. de Pompadour, he became in 1753 historiographer of the royal buildings, and in 1758 publisher of the *Mercur de France*, and thus had a large income. To the *Mercur* he contributed the *Contes moraux*, on which his fame chiefly rests, and which have been greatly admired as specimens of light and lively writing. His position as manager of the *Mercur* was lost after two years in consequence of a satire on the duke d'Aumont, and he was confined for a few days in the Bastille. Admitted into the academy in 1763, he succeeded D'Alembert in 1783 as perpetual secretary. He left Paris during the revolution, was one of the moderate deputies in the council of the ancients in 1797, and lived again in retirement after the 18th Fructidor. His best theatrical pieces are the tragedies *Les Héraclides* and *Numitor*, the operas *Didon* and *Pénélope*, and the comic operas *Sylvain* and *Zémire et Azore*. He also wrote the romances *Bélisaire* (1767) and *Les Incas* (1777), collected his articles in the *Encyclopédie* under the title of *Éléments de littérature* (6 vols., 1787), published a history of the regency of the duke of Orleans, and left treatises, designed for the education of his children, on the French language, logic, metaphysics, and morals, and his own

Mémoires (4 vols., 1804). A complete edition of his works was published in 18 vols. (1808), and a select edition in 10 vols. (1824).—His son, LOUIS JOSEPH, born in Paris in 1789, published two poems of his father, *Polymnie* and the *Neuvaine de Cythère*, and wrote several poems. He went to Mexico, and subsequently to the United States, leading a vagrant life, and died in a hospital in New York in 1830.

MARMORA, Sea of (anc. *Propontis*), a body of water lying between European and Asiatic Turkey; length 172 m., greatest breadth about 50 m. Its N. E. extremity is connected with the Black sea by the Bosphorus, and its S. W. extremity with the Archipelago by the Dardanelles. It is remarkable for its depth, which in some places is more than 350 fathoms. It has numerous excellent harbors on its N. shore, contains several islands, the principal of which is Marmora, and receives the waters of many but inconsiderable tributary streams. It has no tides, but currents of variable strength and velocity run through it. (See BLACK SEA, vol. ii., p. 683.) Its shores present a picturesque aspect, and are especially bold and precipitous on the Asiatic side.—The ISLAND of MARMORA (anc. *Proconnesus*; Turk. *Marmar Adassı*), which gives name to the sea, is about 12 m. long and 6 m. wide, and for the most part mountainous and barren. It has been celebrated from a remote age for its marble (whence its name, from Lat. *marmor*), with which in ancient times it supplied Cyzicus and other Hellenic cities, as in modern times it has supplied Constantinople. The capital, Marmora, stands on the S. W. coast, and is chiefly built of wood. The highest summit of the island is in lat. 40° 36' N., lon. 27° 35' E.

MARMOSET, the common name of the South American monkeys of the family *hapalidæ*, including the genera *hapale* (Illiger) and *midas* (Geoffroy). The number of teeth is the same as in the old-world apes and in man, viz.: incisors $\frac{1}{1}$, canines $\frac{1}{1}$, and molars $\frac{3}{3}$, with acute tubercles. They are all of a size, resembling squirrels in form and agility; the rounded head is frequently furnished with earlike tufts of silky hair on the sides; the feet are five-toed, the posterior having an opposable thumb with a flat nail, all the other fingers of both extremities having sharp claws, with the anterior thumb scarcely opposable; the tail is long and bushy, but not prehensile, and the body is covered with soft woolly fur.—In *hapale* the muzzle is short; the facial angle 50°; the upper lateral incisors insulated, the lower the longest, narrow, and convex outward; lower canines smallest. The striated marmoset or onistiti (*H. jacchus*, Ill.) is about 8 in. long, and the tail about a foot; the general color is a deep gray, with the lower back and tail banded with brown, head chestnut, spot on forehead and long hairs on cheeks and behind the ears white. It is a handsome and cleanly animal, walking on all-fours, and like the rest of its family lives in the woods of Brazil, running

about in the trees in pursuit of insects, fruits, small birds, and eggs; it is easily tamed, and makes an interesting and affectionate pet; in captivity it will eat almost any vegetable or animal food; it is not so intelligent as the other



Striated Marmoset (*Hapale jacchus*).

monkeys; it breeds occasionally in confinement.—In *midas* the lower incisors are short and broad, and the forehead more prominent; the species are commonly called tamarins, and include some of the smallest and prettiest monkeys. The silky marmoset, or marikiva (*M. rosalia*, Geoffr.), is of a golden yellow color, sometimes with a reddish tinge, the fur being very soft and silky and forming a kind of mane upon the neck; its disposition is gentle, but its constitution is so delicate that it soon dies from the exposure of even temperate cli-



Silky Marmoset (*Midas rosalia*).

mates. The leonine marmoset, or leoncito (*M. leoninus*, Geoffr.), is the smallest monkey known; the color is brownish with black face and brown mane, which it erects when angry, whence its name.

MARMOT, a large rodent of the squirrel family, and genus *arctomys* (Schreber). The body is thick and compressed, the head large and flattened, the legs short and stout, and the tail short, bushy, and nearly cylindrical; the incisors are less compressed than in the squirrels, smooth in front and rounded; the molars are $\frac{3}{4}$ - $\frac{1}{2}$, enamelled continuously, with transverse pointed tubercles, the first upper one the smallest; the ears are short and rounded, but distinct above the fur; the fore feet with four toes armed with sharp claws, and a very rudimentary thumb with a small flat nail instead of a claw; the hind feet five-toed, with strong curved claws; the soles are entirely naked; there are very shallow cheek pouches. The common European marmot (*A. marmota*, Schreb.) is 18 in. long, the tail $2\frac{1}{2}$ in.; the color is yellowish gray, with the top of the head dark gray, russet at the base of the tail, and incisors yellow. The form is clumsy, the movements slow, and the sagacity small; inhabiting the mountains of Europe near the snow line, they



European Marmot (*Arctomys marmota*).

live in families in burrows, in which they pass the winter in a state of lethargy; the food is vegetable, during the search for which one animal is stationed as a sentinel near the burrow, into which all retreat at the signal of danger; the circular chamber for the family is approached by a narrow gallery 5 or 6 ft. long; they hibernate on beds of dried grass, and are very fat at the beginning and very lean at the end of this season; when fat they are sometimes used by the mountaineers as food. The Poland marmot (*A. bobac*, Pall.) is somewhat larger, with more reddish tints. They burrow in the plains of less elevated districts in Poland, Russia, and northern Asia; they prefer dry and stony soils, into which they dig very deeply, living in families of 30 or 40, and amassing large quantities of dried grasses. Other marmots are described, which occasionally, as perhaps do all, feed upon birds and small quadrupeds. For the American marmot (*A. monax*, Gmel.) see WOODCHUCK, its common name.—Many animals of the allied genus *permophilus* (Cuv.) are sometimes called mar-

mots, but such come more properly under the head of prairie squirrels. The fur is thick and not very coarse, and is considerably used for common caps, robes, and similar objects.

MARNE (anc. *Matrona*), a river of France, which rises in the department of Haute-Marne, and, after a N. W. course of about 280 m., falls into the Seine near Paris. Its principal tributaries are the Ornain, Blaise, Petit-Morin, and Grand-Morin. The chief cities on its banks are Langres, Chaumont, Joinville, St. Dizier, Vitry-le-Français, Châlons, Épernay, and Meaux. It is navigable from its junction with the Seine to St. Dizier, 210 m. The Marne is connected with the Rhine and Aisne by means of canals.

MARNE, a N. E. department of France, in Champagne, bordering on Aisne, Ardennes, Meuse, Haute-Marne, Aube, and Seine-et-Marne; area, 3,159 sq. m.; pop. in 1872, 386,157. The surface is an inclined plane, sloping from E. to W., and diversified by a few hills of moderate elevation. It is divided into two nearly equal parts by the river Marne, whence it derives its name. The land adjoining this river is rich, but the soil elsewhere is in general light and barren. The principal rivers, besides the Marne, are the Aisne, Suippe, and Vesle in the north, and the Aube and Seine in the south. Great quantities of wine are made, mostly champagne. The most important manufacture is that of wool, which centres chiefly at Rheims. The department is divided into the arrondissements of Châlons-sur-Marne, Épernay, Rheims, Ste. Menchould, and Vitry-le-Français. Capital, Châlons-sur-Marne.

MARNE, Haute. See HAUTE-MARNE.

MARNIX, Philip van. See ALDEGONDE, SAINTE.

MAROCCHETTI, Carlo, baron, an Italian sculptor, born in Turin in 1805, died in Paris, Dec. 28, 1867. He studied in Paris and Rome, and after 1848 went to London. Among his principal works are: "The Fallen Angel" (1831); a bronze statue of Emmanuel Philibert, duke of Savoy, erected at Turin (1838); equestrian statue of the duke of Wellington, at Glasgow (1844); "Sappho" (1850); Richard Cœur de Lion, at London (1851); "Cupid and Greyhound" (1854); equestrian statue of the queen, at Glasgow (1854); and statue of Wellington, at Strathfieldsay (1866). He was employed in a large number of monumental works, such as "The Battle of Jemmapes," a bass relief on the *Arc de l'Étoile*, and the tomb of Napoleon in the Invalides, Paris; monument to the British soldiers buried at Scutari, in London; monument to the officers of the Coldstream guards who fell at Inkerman, in St. Paul's cathedral, London; and a monument to the princess Elizabeth, daughter of Charles I., in Newport church, Isle of Wight. He also executed a large number of portrait busts, among the best of which is one of Prince Albert. He was ennobled by Charles Albert of Sardinia in 1838, and was elected a member of the royal academy in London in 1866.

MARONITES, a body of Syrian Christians who acknowledge the spiritual supremacy of the Roman pontiff. The name appears to have been derived from St. Maron or Maroun, a hermit who lived in the mountains near Tyre, and whose feast is celebrated on Feb. 9. His followers built a monastic stronghold on the banks of the Orontes, near Apamea, which bore his name and became during the early Mohammedan wars the refuge of the Syrian Christians. Another Maron, a Monothelite bishop of the 7th century, induced the greater number of the Syrian Christians to embrace his opinions; and from him also they were called Maronites. Finally John Maron, a monk of the monastery of Apamea, was appointed in 676 bishop of Botrys and patriarch of the orthodox Maronites. This similarity of name has occasioned no little confusion among the church historians of Syria.—The Maronites chiefly inhabit the mountain chain of Lebanon between Tripoli, Tyre, and the lake of Gennesaret. Their chief seat is in the district of Kesrawan. Their early history is enveloped in much obscurity. It is certain, however, that when the last Byzantine troops were withdrawn in 685 from the Syrian fortresses, the Christians held the entire range of mountains from Antioch to Jerusalem; and there they continued to dwell under chiefs of their own, repelling every attack of the Saracens, and affording an asylum to the persecuted Christians of the surrounding provinces. With the original Druse population and the Mohammedan recusants who joined them from time to time, the Maronites appear to have lived in peace. (See DRUSES.) A force of Maronites in 877 helped to defend Syracuse against the Saracens. At the epoch of the crusades they rendered valuable service to the Christian armies. In 1182 a part of the Monothelites abjured their errors before Amaury, Latin patriarch of Antioch; but their union with the Roman church was not formally effected till 1445. They were allowed to retain their own liturgical forms and peculiar customs. This want of uniformity afterward occasioned much trouble in Italy, where large numbers of Maronites had settled. Some of them took refuge in Corsica, to be beyond the reach of the inquisition, and others found an asylum among the Waldenses in Piedmont. The French kings always maintained a connection with the Maronites, who sometimes called themselves the Franks of the East; and after Richelieu had contracted a close alliance with the Turks, a kind of French protectorate was kept up over the Syrian Christians through the consuls resident at Beyrout. In 1713 the united Druses and Maronites were governed by the Mohammedan family of Shehab, under whose leadership the mountaineers successfully resisted the attempts then made by the Porte to reduce them to submission. But in 1756 the conversion to Christianity of several Shehab emirs caused much feeling among the Druses. This spirit of religious antagonism was fos-

tered by the Turkish authorities, who were thus enabled, by playing off one sect against the other, to reduce the mountaineers to partial subjection. When the Druses took up arms to resist Ibrahim Pasha's attempts to reduce them and the Maronites to the administrative conditions imposed on the rest of the population, the Maronites held back till it was too late; their tardy revolt alienated their Egyptian governors without appeasing the resentment of the Druses. The same vacillating policy was manifested when Syria was restored to the Turkish government in 1841. The appointment of Kassim, the son of the deposed Emir Beshir, a Christian, as governor of the Lebanon created dissatisfaction among the Druses and the Turkish inhabitants of Syria. In September and October of that year the Druses rose in arms against the Maronites, and much bloodshed occurred; but the Christian villages were saved from destruction by the timely interference of the English and Turkish authorities. The latter, nevertheless, were notoriously favorable to the Druses. A personal quarrel in August, 1859, between a Druse and a Maronite became the occasion of a war of extermination. (See DRUSES.) In October, 1860, an international commission met in Beyrout, which on June 9, 1861, agreed to a formal treaty concerning the administration of the Lebanon. Since then a special governor, appointed by the Porte, resides at Deir el-Kamr.—The Maronites now (1874) number about 140,000. They subsist by agriculture, are generally poor, live frugally, and their sheiks are but little richer than the mass of the people. They hold property to be sacred, and are strictly honest and hospitable. In religious matters they are governed by a patriarch residing at Kanobin, assisted by bishops. They elect the patriarch, subject to confirmation by the pope. The Maronite priests are married, and number 1,200, with 400 churches. Of the 200 convents scattered through the Lebanon district, one half belong to the Maronites. Their monks, variously estimated between 20,000 and 25,000, follow the rule of St. Anthony. Their dress is a black cassock, with a hood and leathern girdle. They are forbidden the use of tobacco and flesh meat. The nunneries are built at a distance from the convents, no intercourse being allowed between them save for the administration of the sacraments. The liturgy, which is called St. Ephraem's, is the Syriac liturgy of St. James, modified by Ephraem Syrus. Communion is administered in both kinds, the consecrated bread being cut into small pieces, thrown into the wine, and placed with a spoon in the mouth of the communicant. The Gospels and other portions of the Scriptures are read and expounded to the people in Arabic, which is their vernacular.—See Churchill, "Druse and Maronite" (London, 1864).

MAROONS, fugitive slaves in the European colonies in the West Indies and in Guiana, who

banded together in the forests and mountains and for a long time maintained their freedom. The origin of the word is uncertain, it being derived, according to one etymology, from the Spanish *marrano*, "wild hog;" these fugitives subsisting at first chiefly by hunting that animal; according to another, from *simaran* or *cimarron*, which signifies both an ape and a wild man; and by still a third derivation, from Maroni, a river which separates French from Dutch Guiana, where large numbers of them resided. They are especially celebrated in the history of Jamaica. On the conquest of that island from the Spaniards by the English in 1655, most of the Spanish slaves, about 1,500 in number, fled to the mountains, whence they kept up a guerrilla warfare against the whites. Their ranks were continually recruited by runaways; and they became so troublesome that in 1663 the governor, Sir Charles Lyttleton, issued a proclamation offering pardon, freedom, and 20 acres of land to such as should surrender; but it does not appear that any of them accepted the terms offered. The colonial assembly in the course of 40 years passed 44 acts against them, and expended £240,000 in vain efforts for their subjugation. In 1730 they had become so formidable, under a very able general named Cudjoe, that all the militia of the colony and two regiments of regular troops were sent against them. But after seven years' war they were still unsubdued, and in 1737 the colonial assembly imported Indians and bloodhounds from Spanish America to aid in their suppression. Even these failed, however, and at length Gen. Trelawny, the British governor, made overtures of peace to the black chiefs; and on March 1, 1738, the Maroons agreed to a treaty which provided: "First, that all hostilities shall cease on both sides for ever; secondly, that the said Captain Cudjoe, the rest of his captains, adherents, and men, shall be for ever hereafter in a perfect state of freedom and liberty; thirdly, that they shall enjoy and possess, for themselves and posterity for ever, all the land situated and lying between Trelawnytown and the Cockpits, to the amount of 1,500 acres." Besides the arable land thus given them for cultivation, the Maroons had for their hunting grounds the whole mountainous interior of the island. Their game was the wild boar, which abounds in the mountains. They had a method of curing the flesh without salting it, and they sold large quantities of it to the whites, and by this traffic kept themselves well supplied with firearms and ammunition. There were no further hostilities until July, 1795, when a portion of them known as the Trelawnytown Maroons rose in insurrection in consequence of two of their young men having been publicly whipped by the authorities for stealing. The island was put under martial law, although the government had a force of 1,500 regular troops and several thousand militia. After numerous unsuccessful attempts to subdue them, Gen. Walpole by great efforts

brought them to be willing to listen to overtures of peace, and suppressed the rebellion in March, 1796. About 600 of them surrendered on assurances of liberty and good treatment, but were perfidiously placed in confinement, and in June following shipped to Nova Scotia, whence in 1800 they were transported to Sierra Leone. Those who remained in Jamaica maintained their independence; but since the abolition of slavery in the island they have to a great extent intermingled with the mass of the colored population. In 1835 it was officially reported that in four of their settlements in Jamaica there were 270 families, or about 1,500 persons. (See JAMAICA.)—In the Dutch colony of Surinam, in South America, a band of Maroons was formed at a very early period of the colony in the forests of the interior, but they did not become formidable till about 1726, when they had acquired by pillage lances and firearms. They settled on the upper part of the river Saramaca, and were consequently soon known as Saramaca negroes. Several detachments of soldiers and militia having been sent against them without much success, the authorities in 1730 undertook to terrify them into submission by executing eleven of them who had been taken prisoners. One man was hanged alive by an iron hook stuck through his ribs, two others were burned alive, six women were broken upon the wheel, and two girls were beheaded. These cruelties, however, only enraged the Maroons, and their incursions became so troublesome to the colonists that the government at length resorted to negotiation, and a treaty of peace was formally concluded in 1749, between the governor of Surinam and the Maroon chief, Captain Adoe. From some misunderstanding between the parties, this truce was not of long continuance, and fresh revolts broke out among the slaves on the Ouca river, so that in a few years the colony was reduced to the greatest distress by their incursions; and in 1757, after being defeated by the negroes in several encounters, the Dutch again sued for peace. After a long negotiation and four different embassies from the Europeans, a treaty was concluded in 1761, by which the Ouca and Saramaca Maroons were admitted to be free and independent, and the colony agreed to pay them an annual allowance to secure their friendship. After some years a revolt occurred among the negroes on the Coticar river, which gained such force in 1772 that the colonists were forced to abandon their plantations and take refuge in Paramaribo until assistance arrived from Holland. A force of 1,200 Dutch troops, assisted by several hundred negroes liberated and armed for the purpose, at length drove the Maroons back to the woods. With additional troops from Holland a systematic attempt was now made to subdue the Maroons, but without success; and at the end of a war which lasted several years the colonial government withdrew from the contest. The Maroons at that time were about

15,000 in number. In 1831 they had increased to 70,000, and at present they are still more numerous. They form an independent republic, with laws and customs of their own. Christianity has made little progress among them, and their language is a jargon of African and European tongues intermingled.—For an account of the Maroons of Jamaica, see Bryan Edwards, "History of the West Indies," and Dallas, "History of the Maroons;" and for the Maroons of Surinam, see Stedman's "Surinam."

MAROS, a river of Hungary, which rises in Transylvania, near its E. frontier, flows N. W., S. W., and finally W., enters Hungary proper, and after a course of about 400 m. falls into the Theiss near Szegedin. Its principal affluents are the two Kokels in Transylvania, in which country its banks offer much picturesque scenery. The chief towns on its banks are, in Transylvania, Saxon Regen, Maros-Vásárhely, the principal town of the Szeklers, and the fortress Carlsburg; and in Hungary, Ménes, Arad, and Makó.

MAROS-VÁSÁRHELY, a town of Transylvania, capital of the district of Maros, on the river Maros, 60 m. N. E. of Hermannstadt; pop. in 1870, 12,678. It has a fortified castle, with barracks, five churches, among them a Gothic Evangelical church, a Franciscan convent, a gymnasium, a seminary, a library of 60,000 volumes, and a valuable cabinet of minerals. Here the Austrians, on Nov. 15, 1848, obtained a victory over the Szeklers. The town was shortly after occupied by Gen. Bem.

MAROT, Clément, a French poet, born in Cahors in 1495, died in Turin in September, 1544. He succeeded his father Jean Marot, who was also a poet, as valet-de-chambre to Francis I., whom he accompanied to Italy, and was wounded and made prisoner at the battle of Pavia in 1525. On recovering his liberty and returning to Paris, he was imprisoned for a time on the charge of heresy, at the instigation, as has been stated, of Diana of Poitiers. In 1535, the charge being revived, he retired to the court of Margaret, titular queen of Navarre, and went thence to Ferrara and Venice. In 1536 he returned to Paris, having abjured the heretical doctrines at Lyons. His metrical translations of the Psalms, which were very popular, and were sung by the king and the whole court, being condemned as heretical by the Sorbonne, he again fled in 1543 to Geneva, where he added 20 psalms to the 30 previously published. He then went to Turin, where he died in great poverty. His poems consist of epistles, rondeaux, ballads, epigrams, &c. His most important longer productions, besides the translations of the Psalms, were *L'Enfer*, a satire upon the lawyers, and a new version of the *Roman de la rose*. His son Michel was also a poet, though much inferior to him; and a complete edition of the works of the three Marots was published at the Hague in 1731, in 4 vols. 4to. The works of Clément Marot have been frequently reprinted.

MARQUE, Letter of. See **PRIVATEER**.

MARQUESAS ISLANDS, or *Mendaña Archipelago*, a cluster of 13 small islands in the South Pacific ocean, between lat. 7° 45' and 11° S. and lon. 138° and 141° W.; aggregate area, 480 sq. m.; pop. in 1864, about 10,000. They are generally divided into a southern and a northern group. The former (Hiwaoa, Tahuata, Motane, and Fatuhiva) was discovered in 1595 by the Spaniard Mendaña de Neyra, and by him named Las Marquesas de Mendoza in honor of the viceroy of Peru, the marquis de Mendoza. Of the northern group, discovered by Captains Marchand and Ingraham in 1791, the largest islands are Nukahiva, Uahuga or Washington, Uapoa or Adams, Shotomiti or Franklin, and Fatuuhi. They are of volcanic origin, a fact which is attested by long rows of bleak basaltic rocks. Each island is formed by a mountain ridge, which rises to an elevation of 2,000 or 3,000 ft., sending forth numerous lesser chains, between which fertile valleys open toward the ocean. The coast is for the most part rugged and precipitous, and the roadsteads being unprotected furnish no safe anchorage. The climate and productions resemble those of the other volcanic islands of subtropical Polynesia. The rainy season lasts from November to April. Droughts are not unfrequent during the hot season; Krusenstern mentions one which lasted for ten months. The valleys, the soil of which is formed by hundreds of layers of decayed vegetation, are extremely fertile, and produce all tropical fruits in abundance. The yam, sugar cane, banana, plantain, taro, sweet potato, cotton plant, &c., grow almost without culture. The hillsides are covered with forests of cocoanut, breadfruit, and papaw trees, the fan palm, and numerous other trees; but the vigorous growth of underbrush renders them almost inaccessible. The fauna of the islands is as poor as their flora is rich. There are no indigenous mammalia, but swine, rats, and cats have been introduced from Europe. Of birds there are only four or five distinct species; among them the kurukuru and the gupil, a parrot of the size of the robin, are the most beautiful. Water fowl abound on the coast, and valuable mussels are found near the shore.—The inhabitants belong to the Malay race, and are distinguished by grace and symmetry of person. Their complexion is of a light copper color; the women appear almost white, but this complexion is produced by the application of the root of the papaw tree. Tattooing is practised by both sexes. Their social organization is similar to that which prevailed in the Hawaiian islands before the introduction of Christianity. They are divided into many tribes or clans, among whom bloody wars are of frequent occurrence. The *tabu* serves them instead of religion. The tabooed or privileged classes consist of *atnas*, who are venerated as superior beings; *tanas*, soothsayers and "medicine men;" *tataunas*, priests and surgeons; *uhus*, the lowest rank of the hier-

archy; *kataikia*, secular rulers; and *toas*, war chiefs. The non-tabooed classes are the *peio pekeios*, servants of the chiefs; *averias*, fishermen; *hokis*, singers and dancers; and *nohuas*, common laborers. The last named class hold a similar position to that of the pariahs in India. Among the peculiar social institutions of the islanders is polyandry, the woman choosing her husband or husbands, and retaining them or not according to her pleasure. Cannibalism is also practised sometimes, but simply as an act of vengeance; it is only the bodies of slain enemies of which now and then a slice is eaten. Their ordinary food consists principally of vegetables. A highly intoxicating beverage is prepared by chewing the root of the kanoa plant (*piper metisticum*), mixing it well with saliva, and then spitting it into a vessel, in which it is perfected by fermentation. The extensive use of this beverage produces leprosy or consumption. Besides these diseases, elephantiasis, scrofula, liver complaints, inflammation of the lungs, and diseases of the eyes, often resulting in blindness, are common among the islanders. Their scanty clothing is obtained from the mulberry tree, the bark of which they render thin and soft by beating, thus forming a kind of coarse cloth. Their habitations, small log huts thatched with leaves of the cocoanut tree, are erected on stone platforms from 3 to 5 ft. above the ground. In similar houses they bury their dead.—These islanders have no history. Even the first discovery of the islands by Europeans has been entirely forgotten, though the Spaniards, who introduced swine, and also Cook (who in 1774 visited Fetuhugu or Hood island) and Marchand, are still venerated as gods. The Marquesas were taken possession of in 1842 by Admiral Du Petit-Thouars, by authority of the French government. The inhabitants afterward made some unsuccessful attempts at reconquering their liberty. In 1850 the island of Nukahiva was made a penal colony for political convicts. Only one convict was sent there, and the project was abandoned, but the protectorate of France is still maintained.

MARQUETRY. See **BUILD WORK.**

MARQUETTE. I. A central county of the upper peninsula of Michigan, bounded N. E. by Lake Superior and S. W. by Wisconsin, and drained by the Escanaba, Michigamig, and Mecumecum rivers and other streams; area, about 3,425 sq. m.; pop. in 1870, 15,033. The surface is diversified and covered by extensive pine forests. It contains granite and limestone, and immense deposits of iron ore, the mining of which is the chief business. It is traversed by the Marquette, Houghton, and Ontonagon railroad, and by the Peninsular division of the Chicago and Northwestern. According to the census of 1870, there were 11 iron mines (the entire number in the Lake Superior region), employing 2,005 hands, and yielding 690,393 tons of ore, valued at \$2,677,965. There were 8 blast furnaces, 3 foundries,

3 machine shops, 4 breweries, 3 charcoal factories, and 7 saw mills. The shipments in 1872 were 896,877 tons of ore, and 33,072 of pig iron. Capital, Marquette. II. A S. central county of Wisconsin, intersected by the Neenah or Fox river; area, about 550 sq. m.; pop. in 1870, 8,056. The surface is diversified and the soil good; it contains several lakes. The chief productions in 1870 were 144,562 bushels of wheat, 77,488 of rye, 116,049 of Indian corn, 77,881 of oats, 68,950 of potatoes, 49,508 lbs. of wool, 240,408 of butter, 23,391 of hops, and 20,192 tons of hay. There were 2,220 horses, 3,429 milch cows, 1,163 working oxen, 4,265 other cattle, 16,488 sheep, and 4,312 swine. Capital, Montello.

MARQUETTE, a city, port of entry, and the county seat of Marquette co., Michigan, situated on Lake Superior, at the terminus of the Marquette, Houghton, and Ontonagon railroad, 360 m. N. W. of Detroit, and 320 m. N. of Chicago; pop. in 1874, 5,242. It is the chief depot of supplies for the iron mines of the upper peninsula, and the principal point of shipment for the ore. There are three blast furnaces and a rolling mill within the city limits, and several furnaces in the vicinity. Marquette is supplied with water on the Holly plan, is lighted with gas, and has an efficient fire department. It has three banks, with a joint capital of \$700,000; graded public schools, with four school buildings costing \$60,000; a weekly newspaper, a public library, and six churches, viz.: Baptist, Episcopal, Methodist, Presbyterian, and Roman Catholic (two).

MARQUETTE, Jacques, a French explorer, born in Laon, France, in 1637, died May 18, 1675. At the age of 17 he entered the society of Jesus, and in 1666 sailed for Canada as a missionary. He spent about 18 months in the vicinity of Three Rivers, where he acquired the Montagnais and other dialects of the Algonquin spoken in Canada and New York, as well as the Huron and Iroquois. He was first selected for the Mohawk mission, but in April, 1668, went to Lake Superior and there founded the mission of Sault Ste. Marie. In the following year he was sent to take the place of Allouez among the Ottawas and Hurons at Lapointe; but his stay here was short, these tribes being soon dispersed by the Sioux. Marquette then followed the Hurons to Mackinaw, and there in 1671 built a chapel at the mission of St. Ignatius. In the following year he wrote of his success at Mackinaw to Father Dablon, the superior of the Jesuit missions in Canada. "I am ready, however," he continued, "to leave it in the hands of another missionary, to go on your order to seek new nations toward the South sea who are still unknown to us, and to teach them of our great God whom they have hitherto not known." As early as 1669 he had resolved upon exploring the Mississippi, of which he had heard from the Indians, and had made preparations at Lapointe, his topographical skill being an

important aid. His desire was not gratified till 1673, when Frontenac and Talon, the governor and intendant of Canada, having resolved to send Louis Joliet to explore the whole course of the Mississippi, Marquette was instructed to accompany him. With five other Frenchmen they left Mackinaw in two canoes on May 17, and reaching Wisconsin river by way of Green bay, Fox river, and a portage, floated down to the Mississippi, on whose waters they found themselves by the 17th of June. Somewhere near the mouth of the Ohio (which they called the Ouaboukigou, from which was formed the subsequent name of the Wabash) they met savages who assured them that it was not more than ten days' journey to the sea, and that they bought stuffs and other articles of Europeans on the E. side. Continuing their voyage, they arrived at a village called Akamsea, probably about the mouth of the Arkansas. Having satisfied themselves that they were not more than two or three days' journey from the mouth of the river, which undoubtedly emptied into the gulf of Mexico or off the Florida coast, and not, as had been conjectured, in California or Virginia, they resolved to return, especially as their further progress would expose them to the danger of a captivity among the Spaniards. They began their homeward voyage on July 17, and, passing up the Illinois instead of the Wisconsin, arrived in September at Green bay. They had accomplished the object of their mission, and travelled in their open canoes a distance of over 2,500 miles. On the banks of the Illinois Marquette had promised the Kaskaskia Indians to return and preach to them. He was detained by sickness at the mission of St. Francis Xavier on Green bay a full year; but in October, 1674, having previously sent to his superiors an account of his journey down the Mississippi, he set out with two white men and a number of savages for the village of Kaskaskia. On Dec. 14 he was stopped at the portage on the Chicago by infirmities and severe cold, and dismissing the Indians resolved to winter there with his two companions. Resuming his journey, March 30, 1675, he reached Kaskaskia April 8, and at once began a mission by erecting an altar and celebrating the festival of Easter; but conscious that his end was approaching, he soon attempted to return to Mackinaw. He reached no further than a small river whose mouth is on the E. shore of Lake Michigan, and which still bears his name, and there he died in the presence of the two Frenchmen who had attended him from Green bay. He was buried on the spot, but in 1677 his remains were carried to Mackinaw. The narrative of his voyage on the Mississippi was not published till 1681, when it appeared in an incorrect form at Paris in Thévenot's *Recueil de voyages*, accompanied by a map. This narrative, as well as a journal of the missionary's last expedition, and his autograph map, may be found in Shea's "Discovery and Explora-

tion of the Mississippi Valley" (New York, 1852). His narrative, for some years after its first publication, was regarded as a fable; but, although Margry and others have set up theories as to an earlier exploration of the Mississippi by Lasalle, they rest on insufficient data and conjectures, and the claim of Marquette and Joliet as the first explorers of the great river of the west, and the first Europeans who saw it after De Soto, remains unshaken.

MARQUEZ, Leonardo, a Mexican general, born in the city of Mexico about 1818. Entering the army at an early age, he was engaged in several battles in the valley of Mexico against the American army in 1847. He headed a *pronunciamiento* in the state of Guanajuato, Feb. 10, 1849, declaring the election of President Herrera illegal, and recalling Santa Anna to the government. The movement was suppressed, and Marquez was made prisoner, but he was soon set at liberty. After the accession of Santa Anna in 1853, Marquez was intrusted with important commands in the war against Alvarez and Comonfort; and after the flight of Santa Anna, in August, 1855, he continued for two years to maintain a guerilla warfare in his behalf. During the war of reform he became one of the chief military leaders under Presidents Zuloaga and Comonfort. He defeated at Tacubaya, April 11, 1859, the liberal forces, which laid siege to the capital under Degollado, thus saving Miramon from imminent danger, but stained his victory by the execution of his prisoners, including several medical students and other non-combatants. This deed, of which he divides the responsibility with Miramon, is known as the massacre of Tacubaya, and brought upon Marquez an odium from which he has never recovered. After the triumph of Juarez, Marquez continued an irregular warfare in 1861, during which he again stained his reputation by the execution of his prisoners, Generals Degollado and Valle, and of the prime minister Ocampo. For these deeds he was declared an outlaw by congress, and a price was set on his head. He united his forces with the French invaders in 1862, and favored the elevation of Maximilian to the throne; but that prince was unwilling to accept his military services, and gave him an honorable exile as minister to Turkey. In October, 1866, he returned to Mexico without permission, and was appointed to the command of a division. When Maximilian set out for Querétaro in 1867, Marquez was left in command of the city of Mexico, which he defended for three months against Gen. Porfirio Diaz, not capitulating till June 21, two days after the execution of Maximilian. He secreted himself for several weeks, and at last escaped to Havana. He is one of three persons expressly excluded from the amnesty of 1870. He has published two pamphlets in defence of his military record.

MARQUIS, or Marquess, a title of dignity in England, France, and Italy, ranking next be-

low that of duke. In Germany, whence it derives its origin, the corresponding title is *Markgraf*, in English margrave or lord of the marches; and the persons so called or created were originally military chieftains to whom was committed the guardianship of the marches or frontiers of a country. Hence the mediæval Latin word *marchio*. In continental Europe the *marchiones*, from being mere life occupants of their office, became at a comparatively early period territorial potentates, transmitting their titles and possessions, until they were established as a powerful hereditary order of nobility. In England the lords or wardens of the marches were originally barons or earls, whose office it was to preserve the frontier (as on the borders of Wales or Scotland) free from the inroads of the enemy. The office was regarded for many centuries as a special or temporary one, and the term marquis, as distinguished from other titles of honor, was unknown till 1385, when Richard II. created his favorite Robert de Vere, earl of Oxford, marquis of Dublin for life, and gave him precedence between the degrees of earl and duke. The next creation was that of John de Beaufort, earl of Somerset, who was in 1397 made marquis of Dorset, and who, after being degraded in parliament, where he was only considered as earl of Somerset, declined to have the new honor restored to him, on the ground that "the name of marquis was a strange one in the kingdom." It was not again conferred until 40 years afterward, in the reign of Henry VI. Thenceforth it continued to be occasionally bestowed, but was scarcely ever borne by more than three or four persons at a time until the latter half of the reign of George III., when the number of marquises was made equal to that of the dukes. In 1874 the number of marquises who sat under that title in the British house of peers was 21. Of the 20 British dukes, 11 had also the secondary title of marquis in the English, Scottish, or Irish peerage.

MARRACCI, *Ludovico*, an Italian orientalist, born in Lucca in 1612, died in Rome, Feb. 5, 1700. He devoted himself from his youth to the study of languages, became a proficient in Greek, Hebrew, Syriac, Chaldee, and Arabic, and was appointed professor of Arabic in the Sapienza college, and afterward in the Propaganda, at Rome. Pope Innocent XI. chose him as his confessor, and would have advanced him to ecclesiastical dignities had not Marracci declined. He edited the Koran in the original Arabic, with a Latin translation (Padua, 1698).

MARRIAGE, in law, the conjugal union of one man with one woman. In all Christian communities the marriage relation exists, and is considered as the most solemn of contracts; and excepting in Protestant countries, it is regarded as a sacrament. In England, although not a sacrament of the church, it is not only celebrated as a religious ceremony, but until very recently it fell almost exclusively under the cognizance of the ecclesiastical courts.

Since the statute 20 and 21 Victoria, c. 85, however, the new court of probate and divorce has exercised some of the functions heretofore belonging to the ecclesiastical courts, together with some others, especially in the matter of divorce, which are quite new in English law. In the United States marriage is, by law, only a civil contract; magistrates, equally with clergymen, have a right to solemnize it; but it is the prevailing practice of the country to have it performed by a clergyman, and attended with religious ceremonies. One very grave question remains in a state of singular uncertainty; it is: What is necessary to constitute a complete and valid marriage? or rather, are the ceremonies and forms, or any of them, which are indicated by law or are customarily used for the solemnization of marriage, indispensable, or is the mere consent of the parties sufficient? That such a question as this should be unsettled both in England and in this country may well occasion surprise. But the true explanation of the mystery is, we apprehend, that very few persons have trusted to their own mere consent for the validity of their marriage, and the question has therefore very seldom come directly before the courts. Recently, however, this precise question has passed through the English courts. It came first before the court of queen's bench in Ireland, upon a trial for bigamy. The defendant was found guilty, and then, the first of the marriages not having been solemnized according to the direction if not requirement of law, the question arose whether it was so complete and perfect as to make the crime of bigamy possible. There were four judges, and they were equally divided. The chief justice then (against his opinion) joined *pro forma* with the two who thought the marriage valid, and the crime of bigamy committed, for the purpose of having a decision by a majority, from which an appeal could be made to the house of lords in England. On appeal the question of the validity of the marriage by mere consent was fully argued by the ablest counsel in England before the lords, and the six law peers gave their opinions severally, each at great length; and they were equally divided, Lords Brougham, Denman, and Campbell being in favor of the validity of the marriage at common law, and Lords Lyndhurst, Cottenham, and Abinger against it. This equal division affirmed the judgment, and the defendant was sentenced. Almost at the same time, by an odd coincidence, the same question came before the supreme court of the United States, and Chief Justice Taney, in deciding the case (on other grounds), said: "Upon this point the court is equally divided, and no opinion can be given." Nevertheless, the steady tendency of American decisions is in the direction of the conclusion reached by Chancellor Walworth (*Rose v. Clark*, 8 Paige, 574), "that any mutual agreement between the parties to be husband and wife *in presenti*, especially where it is followed by cohabitation, constitutes a valid and

binding marriage, if there is no legal disability on the part of either to contract matrimony;" and such we believe to be the law. (For marriages void or voidable for fraud, duress, or other cause, see DIVORCE.)—Contracts to marry at a future time are recognized by law, and the rules of law in relation to them are in some respects peculiar. The promises must be reciprocal, and a woman is bound by such a contract as much as a man. Nor is there anything in the law to prevent an action by the man for a breach of this contract; but such actions are not common, and would not be favored by court or jury. The action may be brought by an infant, but not against one. The very words, time, and manner of the promise are not often provable, and are never indispensable; for precise and direct testimony to the promise is not demanded. Indeed, courts have, in some instances at least, gone quite far enough in instructing or permitting a jury to infer a promise of marriage from rather slight indications. In general, however, language used to third persons expressive of a purpose, or even a promise, to marry the plaintiff, does not prove this promise, unless it was addressed to a parent or to one who stood in the place of a parent. This contract, like every other, may be on condition; and if the condition be reasonable, the law will respect it, and will not sustain an action on the promise unless the condition be performed. The defences to such an action are, generally, either a denial of the promise, or if that be proved, anything which would make the marriage unlawful. But a previous and existing marriage of the defendant, although it would have made his marriage with the plaintiff illegal and void, would not be a defence against this action, if it were unknown to the plaintiff when the agreement to marry was made by her. The defence most usually relied upon is a denial of the promise; and after that, the bad character of the plaintiff. If this be made out, it is a sufficient defence; but if it be attempted and fails, the attempt may be regarded by the jury as a ground for increasing the damages against the defendant. If the defence be a specific criminal act, it must be proved specifically. If it be general bad character, evidence of bad reputation is receivable. Neither specific bad conduct nor general bad character constitutes a defence, if it was known to the defendant when he made his promise; although, even then, it might be considered in mitigation of damages. There are decisions for and against permitting the fact of seduction to be received in evidence in an action for breach of contract to marry, for the purpose of swelling the damages. But it generally finds its way into the case; and the question of damages is in this case, more than in most others, entirely within the discretion of the jury. The action does not survive to the representative of a deceased promisee, nor can it be maintained against the representative of a deceased promisor.—Contracts in restraint

of marriage are wholly void, by the policy of the law. Thus no action can be maintained on any promise or obligation not to marry; as not to marry any woman but the promisee; or by a widow not to marry again; or a promise not to marry within six years. There is also a class of contracts which, from the frequency with which they appear in English law books, would seem to be not uncommon in that country, and which are called "marriage brokerage (sometimes brocage) contracts." They are, in general, contracts for the payment of money or transfer of property to some person, by way of compensation for his or her procuring a marriage for the party paying. Such a contract is void on grounds of morality and the public good, without any reference to the expediency or propriety of the marriage itself.—The matrimonial connection variously designated in the laws of the first Christian emperors and the decrees of some early councils as *concubinatus* and *licita consuetudo*, was considered by the Roman Catholic church to be a real marriage, though not celebrated with the same solemnity nor attended with the same civil consequences as a contract recognized by both the civil and ecclesiastical courts. It is what in modern times is called "a marriage of conscience," and what ancient jurists termed *semi-matrimonium*. It is still called in Germany *Halbehe*, where the name of half-wife, *Halbweib*, is bestowed on a woman to whom, though a real wife, the husband does not convey his rank. This condition responds to that of the *semi-uxor* of the canonists, who also described such women as *uxores sine dote minus solemniter ducte*. This sort of union, though discountenanced by the Roman Catholic church, was held, when contracted seriously, to be indissoluble. Hence she would not tolerate temporary unions of this kind. Thus, the 17th canon of the first council of Toledo (400) excommunicates all who, having a lawful and acknowledged wife (*uxor*), presume to have also a concubine; while it admits to communion the man who is contented to live for ever with a wife of inferior rank. The canon merely enforced monogamy. (See CONCUBINAGE.)

MARRIAGE SETTLEMENTS. A promise to give or advance to a woman, or settle upon her, money or an estate, on her marriage, is valid; because the marriage is regarded by the law as a sufficient consideration for it. But it must be made in writing and signed, under the English statute of frauds, and wherever that clause is reenacted in this country. A mere representation concerning the pecuniary condition of a party, if made in good faith, will not bind one to make his representations good. Letters from parents or relatives, when sufficiently specific, are held to bind them.—Contracts in fraud of marriage settlements, and intended to defeat them, are void; as a private bargain with the husband, or the husband and wife, that he shall pay back part of her for-

tune; or a promise to restore money lent to give the appearance of wealth, and so procure the marriage; and a note given only to be exhibited and used for the same purpose has been held valid against the promisor. A creditor who conceals or denies his claims, so that the debtor may obtain the consent of the woman or her guardians, is bound by his denial or concealment as effectually as by a release.—As to the power of an infant, especially a female infant, to make a valid settlement of property in view of marriage, the law is not quite settled. An infant of either sex may certainly receive property in such a way; but in an important case in England (18 Vesey, 259), Lord Chancellor Eldon held that a female infant was not bound by her settlement of her estate, but, when she came of age, might annul the settlement and return into possession of all her rights and interests. The opposite doctrine is now established by statute in England, and also by statute or decision in some of the United States.

MARROW, also called **MEDULLA**, a soft, translucent, yellowish or reddish vascular substance, found in the central cavities and in the spongy texture of the bones of man and the higher animals. There are two varieties of marrow, the yellow and the red. The yellow marrow is found principally in the central cavities of the long bones, such as the femur, humerus, and tibia. It consists of a very fine fibrous network, in which are imbedded an abundance of fat vesicles and capillary blood vessels, together with the ramifications of nerves. It is, however, but little or not at all sensitive in its ordinary condition, although when diseased it may, like other parts of the bone, become exceedingly painful. The reddish variety of marrow is found in the interstices of the spongy texture in the extremities of the long bones, in the short and flat bones, and especially in the sternum and the bodies of the vertebræ. It is softer in consistency than the preceding, and contains only slight traces of fat. Besides a delicate fibrous tissue, blood vessels, nerves, and an amorphous albuminous matter, it contains, in the bodies of the vertebræ, the sternum, ribs, and cranial bones, small rounded, nucleated cells; the "marrow cells." Marrow does not exist in cartilage, nor in the compact tissue of bone, but is formed in proportion as the medullary cavities are produced by absorption of the original bone.

MARRYAT. **I. Frederick**, a British author, born in London, July 10, 1792, died at Langham, Norfolk, Aug. 2, 1848. He entered the naval service at 14 years of age as a midshipman on board the frigate *Impérieuse*, and participated in 50 engagements, in one of which he was severely injured. He distinguished himself on several occasions by leaping overboard and rescuing drowning shipmates, for which he subsequently received a medal from the humane society. In 1812-'15 he served on the North American coast; and he participated

in an action with gunboats on Lake Pontchartrain shortly previous to the battle of New Orleans. In 1829, while commanding the *Ariadne* in the channel service, he commenced his literary career by the publication of "Frank Mildmay, or the Naval Officer," a novel of sea life, in which many of his early adventures are related. Among his other novels are: "The King's Own" (1830); "The Pacha of Many Tales" (1835); "The Pirate and the Three Cutters" (1835); "Midshipman Easy" (1836); "Japhet in search of a Father" (1836); "Peter Simple" (1837); "Percival Keene" (1837); "Snarleyvow" (1837); "Jacob Faithful" (1838); "The Phantom Ship" (1839); "Poor Jack" (1840); "Joseph Ruskbrook" (1841); "Masterman Ready" (1841); "The Settlers in Canada" (1844); "The Mission" (1845); "Children of the New Forest" (1846); "The Privateersman" (1846); "The Little Savage" (1848); and "Valerie" (1849). In 1837 he published a "Code of Signals for Vessels employed in the Merchant Service," which has been adopted in England and other countries, and for which he received the cross of the legion of honor from Louis Philippe. In 1838 he made a tour in the United States, and in 1839 published his "Diary in America," in two series, each of three volumes. During the last two years of his life he was compelled by the rupture of several blood vessels to desist from all professional and literary labor. His "Life and Correspondence" (2 vols., 1872) was published by his daughter Florence (Mrs. Ross Church), who is also the author of several novels. **II. Samuel Francis**, son of the preceding, born in 1826, died in London, July 12, 1855. He served several years in the British navy, but resigned his commission, and in 1850 established himself in California. In 1853 he returned to England, and published an account of his adventures under the title of "Mountains and Mole Hills" (London, 1855).

MARS (a contraction of *Mavors* or *Maiores*), the Roman god of war, whose name in the Sabine and Oscan tongues was *Mamers*, and who was early identified with the Greek *Ares*. Before this identification he seems to have been an agricultural rather than a warlike divinity. He was one of the three tutelary gods, to each of whom Numa was said to have appointed a flamen, and he enjoyed the highest honors after Jupiter. He was called *Father Mars* (*Marspiter*), being regarded as the parent of the Romans from having begotten the founders of Rome by Rhea Silvia, a priestess of Vesta. He was distinguished as *Gradivus*, *Silvanus*, or *Quirinus*, in his relations respectively to war, agriculture, and the state. The rites of his worship, as the dances of the *Salii* in armor, had reference to war and victory. The principal temples dedicated to him at Rome were that on the Appian way outside of the *Porta Capena*, and that of *Mars Ultor* in the forum.—*Ares* (*Ἄρης*), son of *Zeus* (*Jupiter*) and *Hera* (*Juno*), was regarded by the Greeks not

so much as the god of war, as of the tumult, horror, and carnage of battle. He is the impersonation of physical strength, delighting in the slaughter of men and the sack of towns. Though worshipped in all parts of Greece, no Greek city regarded him as its tutelary deity. According to the ancients, he was worshipped among the warlike tribes of Thrace and the barbarians of Scythia. He had a temple at Athens containing a statue of him by Alcámenes, and at Sparta there was a statue of him in chains, signifying that the martial spirit would never leave the city. Women were not allowed to participate in his worship.

MARS, the fourth planet in order of distance from the sun, and the nearest to us of the superior planets, that is, of the planets whose orbits lie outside that of the earth. Mars travels around the sun in a mean sidereal period of 686.9797 days, on an orbit inclined $1^{\circ} 51'$ to the plane of the ecliptic, at a mean distance of 139,311,000 m. from the sun; but this orbit is considerably eccentric, inasmuch that his greatest distance, 152,304,000 m., exceeds his least, 126,318,000 m., by more than 26,000,000 m. He returns to opposition at intervals separated by a mean period of 779.936 days, which is therefore the planet's mean synodical period. The earth's mean distance being 91,430,000 m., the mean distance of Mars from the earth at the time when the two planets are in conjunction is about 48,000,000 m. But at a conjunction when Mars is near his perihelion, the distance is much reduced, more indeed than by the 13,000,000 m. by which the perihelion distance of Mars is less than his mean distance. For the perihelion of the orbit of Mars lies in lon. $333\frac{1}{2}^{\circ}$, while the aphelion of the earth's orbit lies in lon. $280\frac{1}{2}^{\circ}$, so that the earth is about 53° from aphelion when in the same longitude as the perihelion of Mars, and is therefore at a distance from the sun considerably exceeding her mean distance. Without entering at any length, however, into niceties of the sort (which would be idle, since conjunctions do not happen exactly when Mars is in perihelion), we may say that at a conjunction near the perihelion of Mars the distance between the two planets amounts to about 35,000,000 m., while at a conjunction near the aphelion of Mars the two planets are separated by about 61,000,000 m. Accordingly, Mars is studied under very different conditions when he is in opposition (to the sun—that is, in conjunction with the earth) near perihelion and near aphelion. For not only is his apparent disk larger in the former than in the latter case in the proportion of about $(61)^2$ to $(35)^2$, or more than 3 to 1, but furthermore the planet is more brilliantly illuminated (and will therefore better bear telescopic magnifying) in the former case in the proportion of about $(152)^2$ to $(126)^2$, or nearly as 3 to 2. On the whole, therefore, the planet can be more favorably studied in the former case than in the latter in the proportion of about 9 to 2, measuring the conditions by the

amount of magnifying due to proximity and to the telescopic powers practically available. To ordinary observation, the effect of the considerations just pointed out is that Mars when in opposition near perihelion looks about $4\frac{1}{2}$ times brighter than when in opposition near aphelion. The opposition of the year 1877 will illustrate this; for during the oppositions which have recently occurred Mars has been far from perihelion, the opposition of 1869 occurring when Mars was nearly in aphelion, and those of 1871 and 1873 being little more favorable. In the opposition of 1875 he will be nearer, but still some 65° from his perihelion. But in 1877 the place of opposition will have been carried more nearly to the perihelion (somewhat past that point) than previously for more than 30 years. He will therefore present a very distinguished appearance in the heavens, being little inferior in brightness to the planet Jupiter. It is indeed a noteworthy circumstance that theoretically Mars should then be brighter than Jupiter. That is, comparing the size of his disk with that of Jupiter, and the amount of light received by the two planets from the sun, Mars should be brighter when he is in opposition near perihelion than Jupiter ever is; but owing either to the inferior reflective quality of the surface of Mars, or more probably to the fact that most of the light of Jupiter is reflected from cloud masses, and that a portion of that light is inherent, Jupiter in opposition is always brighter than Mars ever is.—The diameter of Mars is variously estimated by different observers, but is probably about 4,400 m. The volume of his globe is therefore less than the earth, in the proportion of about 168 to 1,000, or the earth is nearly six times as large as Mars. The mass of the planet is however even smaller in proportion; for his density is estimated at seven tenths of the earth's, and his mass, though less than hers in the proportion of about 118 to 1,000, is nearer one ninth than one eighth of the earth's mass. This small planet rotates on an axis inclined about 28° to the orbit, so that the seasons have a greater range than those of the earth, whose inclination to her orbit is but $23\frac{1}{2}^{\circ}$. The rotation has been determined with a near approach to accuracy. Cassini, who was one of the first to study the telescopic aspect of Mars, assigned to the planet a rotation period of 24h. 40m. Sir W. Herschel in 1777 attacked the problem with less success than usually attended his work as an observer. He unfortunately missed count of one rotation in a synodical revolution of Mars, and this error, distributed among all the rotations of the revolution (corresponding to about 24h. divided into 750 parts), amounted to nearly two minutes, so that his estimate of the rotation period, 24h. 39m. 25s., was about two minutes too fast. Mädler, from observations extending over the years 1830-'37, deduced a period of 24h. 37m. 23.8s. Kaiser of Leyden, combining his own observations with those by

Mädlar, Sir W. Herschel, and Huygens in 1672, deduced a rotation period of 24h. 37m. 22.62s. Lastly, the present writer, by combining observations made in 1873 with Hooke's observations in 1666, deduced the period 24h. 37m. 22.73s. As this differed more from Kaiser than could be explained if neither Huygens's observations nor Hooke's had been misunderstood, Kaiser went afresh over his work, and obtaining his former result expressed the opinion that Hooke's observation was untrustworthy. But the present writer, having carefully examined Kaiser's work, found that Kaiser had apparently counted the years 1700 and 1800 as leap years; at any rate, he had somehow counted two days too many in the interval of about 200 years. This excess of one day per century really corresponded to a defect of 37m. 23s., since a Martian rotation too many had been of course introduced along with the extra day, and a Martian rotation requires 24h. 37m. 23s. instead of 24h., so that the additional terrestrial day fell short by 37m. 23s. of what was really required to provide (so to speak) for the added Martian day. Now if we divide 37m. 23s. by the number representing all the Martian rotations in a century, or roughly if we divide 2,250 seconds by 35,000, we obtain about 0.065 of a second; and adding this to Kaiser's value of the rotation period, we obtain 24h. 37m. 22.685s. This is near enough to the writer's value (24h. 37m. 22.735s.) to show that both Huygens's picture and Hooke's can be relied upon, the difference resulting merely from such errors in drawing as might be expected. We may therefore assign a part of the difference to error in Hooke's picture, and the rest to error in Huygens's. After a critical examination of the two pictures for this purpose, the present writer finds that the most probable value of the rotation period is 24h. 37m. 22.715s., the true value almost certainly lying between 24h. 37m. 22.7s. and 24h. 37m. 22.73s. This is the only case in which the rotation of a planet has been determined, or probably can be determined, with so great an approach to exactness. The marks on Mercury and Venus are too uncertain to be trusted, and the planets Jupiter and Saturn do not in all probability show their real surface to us. The determination of a planet's rotation period is not a mere matter of curiosity; for when the period has been determined with considerable accuracy, a planet may be regarded thenceforth as a sort of celestial chronometer, by which changes in the rate of other motions may be inferred if not gauged.—The surface of Mars has been carefully studied by many skillful observers. Hooke, Cassini, Huygens, and Fontana were the first to recognize any of those markings which are now known to belong to the real surface. They noticed that the polar parts of the planet appeared to be occupied by white matter; the idea does not seem to have presented itself that this matter might be like the snow and ice which are found in the polar regions of our

earth. On the contrary, when Maraldi in 1720 studied these white regions, and found that one of them had diminished in size, he predicted its entire disappearance. It was not until Herschel had carefully examined them for a considerable time, and found their variations to correspond to the progress of summer and winter in the northern and southern hemispheres of the planet, that the resemblance between the white spots and our arctic and antarctic snows was recognized, and that Herschel, ever on the watch for analogies of the kind, expressed the opinion that these spots are the snows of Mars. The other parts of the planet present two chief colors, a faint ruddy tint, apparently representing the continents of the planet, and a still fainter indigo-green tint, which from an early period has been regarded as indicating the presence of seas and oceans upon that distant world. It was for a long time impossible, however, as Dr. Whewell pointed out, to be certain that this interpretation of the white spots and of the greenish markings was correct, or that water existed in any form on the surface of Mars. But recently the spectroscopic analysis of the light of Mars has shown beyond question that at times the vapor of water exists in the planet's atmosphere, since the same bands are seen which appear in the solar spectrum when the sun is low down and shining through the denser and more moisture-laden parts of our atmosphere. Nevertheless, it is not easy to understand how the condition of Mars as to temperature can so nearly resemble the earth's, as we should have to believe if we considered only the relative extent of the snowy polar regions in the two planets. Mars is so much further from the sun that the solar radiation is reduced, as compared to that to which our earth is exposed, in the ratio of about 1 to 2 when Mars is in perihelion, and of about 1 to 3 when he is in aphelion. Moreover, being a much smaller planet, we should expect his atmospheric envelope to be much less dense, since if reduced as his volume it would be reduced as the cube of his linear dimensions; whereas it would extend over a surface reduced only as the square of those dimensions. On this assumption there would be less air per square mile of the planet in the proportion of about 11 to 20; and as gravity at the surface of Mars is less than gravity on the earth in the ratio 387 to 1,000, the atmospheric pressure would be less as about 4,257 to 20,000, or would be little more than one fifth that of the earth's sea level. Of course, we have no certain assurance that the assumption here made is even approximately correct. But since, to make the climate of Mars as warm as our earth's, the atmosphere should be much denser than ours, whereas the assumption which must be regarded as the most probable would make the atmospheric density barely one fifth of ours, it seems difficult to regard the climate of Mars as probably like that of our earth. There are reasons, therefore, for viewing as at least worthy of

consideration the theory of Mattieu Williams, that the climate of Mars is really unlike that of our earth, notwithstanding the similarity of the snow regions in extent. Without entering into the details of his theory, or accepting the relations which he somewhat speculatively exhibits, we may thus far provisionally adopt his views as not improbable.—Owing to the much smaller amount of solar radiation at the distance of Mars, and also to the much more limited extent of his oceans, the quantity of aqueous vapor raised into his atmosphere must be very much less in proportion to the extent of his surface; and it is not unlikely that most of the precipitation of such vapor takes place in the form of snow, which would not fall thickly, and would be soon melted during the Martial day in the tropical and subtropical regions. Thus we may explain the appearances which have hitherto been regarded as due to the dissipation of Martial rain clouds, and also the observed fact that the disk of Mars is whitish near the edge, and the markings invisible there. Thus whatever aqueous vapor, or cloud, was carried to the temperate regions, and whatever ice or snow accumulated in the polar regions, would be much smaller in amount than we should otherwise have inferred from the apparent extent of the polar snow caps, and these would therefore diminish in extent as summer advanced, much more quickly than they would if formed as in the earth's case. The general conclusion to which we should be led if we adopted this view would be that the planet presents conditions unfavorable for the existence of such forms of life as we are familiar with. These questions derive their chief scientific interest, however, as suggesting the careful study of those Martial phenomena which presumably depend on the density of the planet's atmosphere, and its general conditions as respects humidity and so on.

MARS, Anne Françoise Hippolyte Bontet, a French actress, born in Paris, Feb. 9, 1779, died March 20, 1847. She was the natural daughter of Jacques Monvel, one of the first actors of the day, and a provincial actress named Mars-Boutet, and made her appearance upon the stage in her childhood. At 14 years of age she filled what the French call *rôles d'ingénues*, and when somewhat older attempted with success *jeunes amoureuses*; but she made no decided impression upon the public until her personation in 1803 of a deaf and dumb girl in the *Abbé de l'Épée*. The grace and feeling which she evinced on this occasion created an enthusiasm in her favor, and soon after the retirement of Mlle. Contat in 1809, she assumed the position of the first comic actress of the day. For the last 30 years of her professional life she was without a rival on the French stage in genteel comedy, every new part attempted by her being a success down to that of Mlle. de Belle-Isle in Dumas's drama of that name, produced in 1839, in which, although 60 years of age, she appeared like a young wo-

man of 20. She took her leave of the stage in March, 1841. Although some of her greatest triumphs were achieved in the plays of Victor Hugo, Dumas, and other modern writers, she greatly preferred the dramas of the old school, especially the comedies of Molière and the *pièces d'intrigue* of Marivaux. Her personations of the fashionable lady or coquette of the old régime in these works are among the most cherished traditions of the French stage. Her figure, voice, action, and toilette were alike admirable, and in the expression of her countenance she invariably conformed to the spirit of the scene. She amassed a considerable fortune, and the latter years of her life were passed in a sumptuous retreat, where she daily received visits from persons eminent in literature or the arts. She left an estate valued at 800,000 francs to a son 50 years old at her death, whom during the greater part of her life she had persistently refused to see.

MARSALA (anc. *Lilybæum*), a fortified seaport town at the W. extremity of Sicily, adjacent to Cape Boeo (anc. *Promontorium Lilybæum*), in the province and 16 m. S. S. W. of the town of Trapani; pop. about 18,000. It contains a cathedral, several churches, and various monastic, educational, and charitable establishments. It exports corn, cattle, oil, salt, and soda, but chiefly wine.—The ancient city of Lilybæum, of which Marsala occupies only the southern half, was founded by a colony of Carthaginians who escaped from the destruction of Motya by the elder Dionysius in 397 B. C. It soon prospered, and became the chief bulwark of the Carthaginian power in Sicily. In 276 Pyrrhus of Epirus made an unsuccessful attempt to capture it; and in 250 it was attacked by the Romans in the first Punic war with two consular armies and a formidable fleet. After several efforts to carry it by assault, the consuls converted the siege into a blockade, which was maintained for nearly ten years without accomplishing its object; nor did the Romans obtain possession of it until it was surrendered by the Carthaginians at the conclusion of the war, in part purchase of peace. From this period the harbor of Lilybæum became a principal station of the Roman fleet, and the city one of the great points of communication between Rome and Africa. The place continued prosperous till the 16th century; but from the period when the emperor Charles V. caused its harbor to be blocked up with a mound in order to protect it from the attacks of the Barbary corsairs, it ceased to hold the first rank among the maritime towns of W. Sicily, and gave place to Trapani. Few vestiges of the ancient city now remain. Numerous fragments of sculpture, however, vases, coins, &c., have been from time to time discovered, and some portions of an aqueduct are still standing. Marsala was Garibaldi's landing place in his expedition to Sicily in May, 1860, where he disembarked in presence of two Neapolitan war steamers.

MAR SCHNER, Heinrich, a German composer, born in Zittau, Aug. 16, 1795, died in Hanover, Dec. 15, 1861. He was almost a self-taught musician, his parents being too poor to afford him proper instruction. He acquired a little knowledge of the art here and there, and with this set about composing in every form. Having composed a ballet for a troupe of dancers, the orchestra was brought to a sudden stop, the horns having notes to play that were not on their instruments. In 1816 he wrote a little opera, *Der Kyffhäuserberg*, and in 1819 he produced at Dresden *Heinrich IV. und Aubigné*, an opera in three acts. In 1823 he became, jointly with Morlacchi and Von Weber, musical director of the opera in Dresden. In 1828 *Der Vampyr*, his most celebrated work, was produced at Leipsic. In 1830 he was called to Hanover as chapelmaster to the king, and there he composed two other successful works, *Das Schloss am Aetna* and *Hans Heiling*. He also composed many songs for single voices, ten collections of male-voice part songs, trios, and quartets for instruments, and a variety of sonatas, fantasias, and rondos.

MARSDEN, William, a British orientalist, born in Dublin, Nov. 16, 1754, died near London, Oct. 6, 1836. In 1771 his father, who was a merchant of Dublin, procured for him an appointment in the civil service of the East India company at Bencoolen, Sumatra. He there attained the office of principal secretary to the government, acquired a close acquaintance with the country and the Malay language, and in 1779 returned to England. In 1795 he was made chief secretary to the admiralty, with a salary of £4,000; and on his resignation in 1807, the government conferred on him a pension of £1,500. In 1834 he bequeathed his rich collection of coins and medals to the British museum, and his valuable library of oriental books and manuscripts to King's college, London. The most important of his works are: "History of Sumatra" (London, 1782); "Grammar and Dictionary of the Malay Language" (1812); a translation of the travels of Marco Polo (1817); and *Numismata Orientalia*, a treatise on eastern coins, &c. (1823-'5).

MARSEILLAISE, a national song of France, produced in 1792 by Rouget de l'Isle, an officer then stationed at Strasburg, and hence originally called *Chant de guerre de l'armée du Rhin*. It soon attained popularity throughout the country, and greatly contributed to the victories of the French revolutionary armies. In Paris it was sung for the first time by the band of men who were brought from Marseilles by Barbaroux to aid in the revolution of Aug. 10, 1792. Hence it was called *Le chant des Marseillais*, and afterward *La Marseillaise*. It has since continued to be the favorite song during all popular movements in France. The researches of musical scholars within the last quarter of a century, both in France and Germany, seem to prove beyond reasonable doubt that the melody was not composed by Rouget

de l'Isle, but was copied by him from the *credo* of the fourth mass of Holtzmann of Mursberg, who composed it in 1776; and it was first heard in Strasburg in the hotel of Mme. de Montesson, in 1782.

MARSEILLES (Fr. *Marseille*; anc. *Massilia*), a city and the principal seaport of France, capital of the department of Bouches-du-Rhône, on the N. E. shore of the gulf of Lyons, at the head of a bay the entrance to which is sheltered by a group of islets, in lat. 43° 18' N., lon. 5° 22' E., 400 m. S. S. E. of Paris; pop. in 1872, 312,864. It is connected by railway with the principal cities of France, by steamers with the chief ports of the Mediterranean, the Levant, and Algeria, and is the centre of the Indian overland mail service. On its N. side lies the old town, with filthy and tortuous streets and lanes, but containing some spacious squares, a remarkable town hall, and the remains of Roman ramparts. It is separated from the new town by a magnificent avenue, which is successively called Rue d'Aix, in its central part Rue du Grand Cours, and afterward Rue de Rome, and which extends in a straight line from the gate of Aix to that of Rome, traversing the entire length of the city from N. to S., and leading to the Prado, the most popular promenade on the seaside. The handsomest of the many fine streets of the new city is the Cannebière, which leads from the Grand Cours to the old harbor, and contains the most elegant shops, hotels, and coffee houses, including the beautiful Café Turc, chiefly frequented by Greeks and Levantines. The new city is built around the port. The quays are the most bustling and interesting parts of Marseilles, being constantly thronged by crowds of orientals, Greeks, Italians, English, and French, who are engaged in the business of the place. The animation of the city is only equalled by the picturesqueness of its locality. It rises over its port in the form of a gradually sloping amphitheatre; the surrounding hills are covered with olive gardens and vineyards, and with thousands of country houses or *bastides* of the citizens. Opposite the mouth of the harbor is the château d'If, in which Mirabeau was imprisoned. On summer evenings the inhabitants seek relief from the heat on the seaside, which is crowded with pleasure boats; and many fine residences and places of public entertainment are situated along the banks. All parts of the city are well supplied with water through a canal fed by the Durance, and opened in 1850, at a cost of \$10,000,000. The public buildings possess little architectural interest. The cathedral is said to have been built upon the site of a temple of Diana; the church of St. Victor is the most ancient church, and was formerly one of the most celebrated abbeys in Christendom. There is a French Protestant church, a place of worship for the English residents, a Greek church, and a synagogue.—Among the public institutions are an arsenal, a mint, a lyceum, a med-

ical school, a hydrographic institution, a school for instruction in Arabic, an industrial and commercial academy, a fine observatory, a museum of pictures, antiquities, medals, and natural history, a library of about 75,000 volumes, a botanic garden, an academy of sciences, letters, and art, medical, agricultural, and statistical societies, and a number of newspapers. The Grand theatre resembles the Odéon of Paris. Besides the Hôtel-Dieu, there are a lunatic asylum, a lying-in hospital, several public institutions for the relief of the poor, a school for deaf mutes, and other public and private charitable establishments. The lazaretto, which was so large that it could hold the entire French army on its return from Egypt, was pulled down in 1850 and removed, as well as the sanitary department, to the quarantine roadstead of Frioul, which was formed by connecting the fortified islets of If, Pomègue, and Ratonneau by means of a breakwater.—The old harbor is an oblong basin 1,000 yards long by 380 broad, occupying an area of about 70 acres, has a depth of water varying from 18 to 24 ft., and can accommodate 1,200 merchant vessels. It is protected on the right by Fort St. Nicolas, and on the left by Fort St. Jean. N. of it is the new harbor, La Jollette, which was completed in 1855. It is formed by a breakwater 1,300 yards long, thrown into the sea parallel to the shore, and at a distance of 1,300 ft. from it; two piers stretch toward it from the shore, at a distance of 600 yards from each other, so as to leave room for the entrance of vessels. It forms an inner basin and two outer harbors, and the former is connected with the old port by a canal, which runs behind the fort of St. Jean. The inner basin and this canal cover an area of about 70 acres. Other basins of still greater extent have been constructed since, so that at present they embrace a water area of about 200 acres. The imports in 1871, inclusive of gold and silver, were valued at 964,000,000 francs, the exports at 732,000,000 francs. The imports of grain and flour amounted to 6,500,000 quintals, valued at 151,000,000 francs. Marseilles trades with all parts of the world, but chiefly with the Levant, Algeria, and other coasts of the Mediterranean. The number of French vessels entering the port in 1871 was 5,120, tonnage 1,809,000; French vessels clear-

ed, 3,556, tonnage 878,000; foreign vessels entered, 3,715, tonnage 908,000. The manufactures consist principally of soap, morocco and other leather, glass, porcelain, caps, straw hats, refined sugar, salt, liqueurs, &c.—The ancient city was founded about 600 B. C. by Ionian colonists from Phocæa in Asia Minor. (See ΦΟΚÆΑ.) The prosperity and the commerce of the new settlement made rapid progress. Massilia became the rival of Carthage and the ally of Rome. Many new settlements were founded by her along the coast of the Mediterranean, and remained under her subjection, and her navigators advanced as far as the Baltic (about 350). (See PYTHEAS.) Threatened by hostile tribes, the inhabitants of Massilia called the Romans to their assistance (153—



The Bourse, in the Cannebière.

125). The city was left in possession of its independence after the subjugation of Gaul, but in 49, having declared for Pompey at the outbreak of the civil war, it was seized by Cæsar and annexed to the Roman republic. Massilia became then celebrated as a seat of learning, and was called the new Athens. Christianity was introduced there in the 3d century. After various vicissitudes the city came in the latter part of the 9th century under the sway of Boso, king of Cisjurane Burgundy, and in the 13th under that of the counts of Provence; and in 1481 Marseilles with Provence was united to the crown of France. In 1524 it resisted the constable de Bourbon. The religious wars were carried on with great bitterness in Marseilles, and the city submitted to Henry

IV. only in 1596. It was deprived of its franchise by Louis XIV. in 1660. In 1720-'21 it was desolated by the plague, which destroyed 40,000 or 50,000 persons, on which occasion Bishop Belzunce distinguished himself by his zeal for the sick; a monument perpetuates his memory, and the poet Pope has celebrated his heroism. During the French revolution, the city declared itself in favor of the Girondists, but it was taken by the terrorists. Schlosser says: "Fréron erected a revolutionary tribunal without a jury in Marseilles, and selected the refuse of humanity for his judges. It almost appeared as if the commissioners of the convention would annihilate the city itself and even the harbor. Executions were of daily occurrence, and the destruction of buildings continued for months, while Fréron dated his reports to the convention, according to the savage style of his time, not from Marseilles, but from 'commune unnamed.'" It was only after the restoration of the Bourbons that Marseilles fully recovered from these calamities. The colonization of Algeria gave a powerful impetus to its commerce. During the war of 1870-'71 it was repeatedly the scene of violent popular commotions, and an imitation of the Paris commune movement took place in March, 1871. The government troops re-occupied the city, after a struggle, on April 4.

MARSH, Anne (CALDWELL), an English authoress, born at Lindley Wood, Staffordshire, near the close of the last century, died there in October, 1874. About the year 1820 she was married to Arthur Cuthbert Marsh, a London banker, who died in 1849. In 1858, upon the death of her brother, author of a "Treatise on the Law of Limitation," she succeeded to the family estates, and assumed as an additional surname that of her own family, being styled Anne Marsh-Caldwell of Lindley Wood. Her first work, "Two Old Men's Tales," was published in 1834. Others followed in rapid succession, two or three sometimes appearing in a single year, the last in 1857. They are: "Tales of the Woods and Fields," "Triumphs of Time," "Mount Sorel," "Aubrey," "The Admiral's Daughter," "Emilia Wyndham," "Father Darcy," "The Protestant Reformation in France," "Norman's Bridge," "Angela," "Lady Evelyn," "Mordaunt Hall," "Lettice Arnold," "The Wilmingtons," "Time the Avenger," "Ravenscliffe," "Castle Avon," "The Song of Roland, chanted before the Battle of Hastings" (translated from the Norman French), "The Heiress of Haughton," "Evelyn Marston," and "The Rose of Ashurst." Most of these works have been republished in America. Her elder sister married a son of William Roscoe, author of "The Life of Lorenzo de' Medici," and a younger sister was the first wife of Sir Henry Holland.

MARSH, Dexter, an American paleontologist, born in 1806, died in Greenfield, Mass., April 2, 1853. Without education, and by occupation a day laborer, his attention was first at-

tracted to the subject of fossils by observing in 1835 the footprints in slabs designed for flagging stones. He was early engaged in the search for specimens, sometimes in the employ of others, but in later years chiefly on his own account, traversing the valley of the Connecticut from the northern line of Massachusetts to Wethersfield, and visiting also the states of New Jersey and New Hampshire. At the time of his death, notwithstanding his frequent supplies to others, his cabinet contained, as the result of his own personal exertions, perhaps the choicest collection of fossil footprints and fishes then in existence. One slab, 10 ft. in length by 6 in width, contained at least 70 distinct footprints; and another, 7 ft. by 4, was literally covered with perfect impressions. There were in all about 500 slabs with tracks and raindrops impressed upon them, and 200 specimens of fossil fishes. After his death the whole collection was sold for about \$2,700. (See FOSSIL FOOTPRINTS.)

MARSH, I. George Perkins, an American scholar, born in Woodstock, Vt., March 17, 1801. He graduated at Dartmouth college in 1820, and then removed to Burlington, Vt., where he studied law and was admitted to the bar. In 1835 he was elected a member of the supreme executive council of Vermont, and in 1842 became a representative in congress, retaining his seat in that body by successive re-elections till 1849, when he was commissioned by President Taylor as minister resident at Constantinople, which office he held for four years. In 1852 he was sent on a special mission to Greece. During his residence abroad he travelled extensively in the East and in Europe, passing some time in Denmark, Sweden, and Norway, where he has long been recognized as a leading Scandinavian scholar. On his return from Europe in 1853 he was appointed one of the commissioners to rebuild the state house at Montpelier, which was burned in January, 1857, and served as railroad commissioner for Vermont for two years (1857-'9). In 1857 he was appointed by the governor of Vermont to make a report to the legislature in regard to the artificial propagation of fishes. In 1860 he received the degree of LL. D. from Dartmouth college. In 1861 he was appointed minister to Italy, a post which he still holds (1875). Besides numerous addresses and speeches, and contributions to periodicals, he has published a "Compendious Grammar of the Old Northern or Icelandic Language, compiled and translated from the Grammar of Rask" (Burlington, 1838); "The Camel, his Organization, Habits, and Uses, considered with reference to his Introduction into the United States" (Boston, 1856); "Lectures on the English Language" (New York, 1861; originally delivered in 1859 in the post-graduate course of Columbia college, New York), in which he "aimed to excite a more general interest among educated men and women in the history and essential character

of their native tongue, and to recommend the study of the English language in its earlier literary monuments rather than through the medium of grammars and linguistic treatises;" "Origin and History of the English Language" (New York, 1862); and "Man and Nature" (New York, 1864). This, with numerous corrections by the author, was translated into Italian (Florence, 1870), and afterward almost entirely rewritten and republished under the title, "The Earth, as modified by Human Action" (New York, 1874). **II. Caroline** (CRANE), wife of the preceding, born in Berkley, Mass., Dec. 1, 1816. She was married in 1838. Her published productions are: "The Hallig, or the Sheepfold in the Waters," translated from the German of Biernatzki, with a biographical sketch of the author (Boston, 1857); and "Wolfe of the Knoll and other Poems" (New York, 1860).

MARSH, Herbert, an English author, born in London in 1757, died in Peterborough in 1839. He was educated at St. John's college, Cambridge. In 1783 he went to Germany, and resided in Göttingen, where he published in German a series of pamphlets in defence of the war policy of Great Britain, for which Mr. Pitt rewarded him with a pension. On the French invasion of Germany he returned to England, and in 1807 was appointed Lady Margaret's professor of divinity at Cambridge, and substituted English for Latin in the delivery of his lectures. In 1816 he was made bishop of Llandaff, and three years subsequently was translated to Peterborough. He was a distinguished opponent of both Calvinists and Roman Catholics. His principal works are: a translation of Michaelis's "Introduction to the New Testament" (London, 1792-1801); "The Authenticity of the Five Books of Moses considered" (4to, Cambridge, 1792); "The National Religion the Foundation of National Education" (1811); "Lectures on the Criticism and Interpretation of the Bible" (1838); and "Lectures on the Authenticity and Credibility of the New Testament, and on the Authority of the Old Testament" (new ed., 1840).

MARSH, James, an American scholar, born in Hartford, Vt., July 19, 1794, died in Colchester, Vt., July 3, 1842. His early life was passed on his father's farm. He graduated at Dartmouth college in 1817, and at Andover theological seminary in 1822. Soon after he became a tutor in Hampden Sidney college, Virginia. In 1824 he was appointed professor of modern languages there, and ordained to the ministry. He was called in 1826 to the presidency of the university of Vermont, which office he resigned in 1833, in order to devote all his time to the duties of the chair of moral and intellectual philosophy, which he occupied until his decease. In 1829 he published an edition of Coleridge's "Aids to Reflection," with notes and a preliminary essay, and a series of papers on popular education; and in 1830 a volume of "Selections from Old English Wri-

ters on Practical Theology." He published also a translation of Herder's "Spirit of Hebrew Poetry" (2 vols., Burlington, 1833). Dr. Marsh received the degree of D. D. from both Amherst and Columbia colleges. Prof. Torrey, who succeeded him in his professorship, published a volume of "Remains," consisting chiefly of his philosophical lectures, with a memoir (Boston, 1843).

MARSH, Othniel Charles, an American naturalist, born in Lockport, N. Y., Oct. 29, 1831. He studied at Phillips academy, Andover, Mass., and at Yale college, where he graduated in 1860, and spent the next two years in the Yale scientific school. From 1862 to 1865 he studied at the universities of Berlin, Heidelberg, and Breslau, and on his return to America in 1866 was elected professor of paleontology in Yale college. His scientific publications, which began while he was a student, have been very numerous. Among his earlier papers, most of which appeared first in the "American Journal of Science," are: "The Gold of Nova Scotia" (1861); "Description of a New Enaliosaurian, *Eosaurus Acadianus*" (1862); "Description of an Ancient Sepulchral Mound" (1867); "Contributions to the Mineralogy of Nova Scotia" (1867); "Origin of Lignilites or Epsomites" (1867); "Metamorphosis of Sirendon into Amblystoma" (1868); "Notice of New Mosasauroid Reptiles from New Jersey" (1869); and "Notice of New Fossil Birds from the Cretaceous and Tertiary of the United States" (1870). For several years he has devoted himself to investigating the extinct vertebrate animals of the Rocky mountain region, especially those of the cretaceous and tertiary formations. Since 1868 he has nearly every year led an expedition to regions never before visited by white men. These expeditions have been remarkably successful, more than 300 species of new fossil vertebrates having been discovered, about 200 of which he has already described. Many of these extinct animals are of great scientific interest, and represent several new orders, as well as a number of others not before found in America. Among these are the *ichthyornithes*, a new order of cretaceous birds, having teeth and biconcave vertebrae; the first American pterodactyls, or flying lizards, some having a spread of wings of 25 ft.; the *dinocerata*, gigantic eocene mammals with six horns; the *brontotheriidae*, huge miocene mammals with a single pair of horns; and likewise the first fossil monkeys, bats, and marsupials from this country. These and many other discoveries have been described by him in a series of papers published in 1871-'3. He was in 1874 preparing an extensive report, in which full descriptions, with illustrations, of all his western discoveries will be published under government auspices.

MARSHAL (Fr. *maréchal*; old Ger. *Marah*, horse, and *Scalc* or *Schalk*, servant), a term originally applied to the person who had charge of the horses of the king or other high dignitary.

In the middle ages he was the chief officer of arms, and at tournaments regulated combats in the lists; but ultimately the title was borne by both civil and military officers. In England, until 1849, the marshal of the king's household presided over the knight marshal's court created by Charles I., which had jurisdiction of personal actions within a circuit of 12 miles around Whitehall. The marshal of the king's bench has the custody of the Marshalsea or king's bench prison in Southwark. The earl marshal is an officer of state, who directs important ceremonies, takes cognizance of matters relating to pedigree and rank, and proclaims the declaration of war or of peace. In the United States, a marshal is an officer of one of the federal judicial districts, having duties similar to those of a sheriff. In ancient Poland the president of the diet was called marshal.—The rank of field marshal (called in German *Feldmarschall*, in French *maréchal de France*) is the highest military dignity in several countries of Europe. The title appears to have been introduced into France in the time of Philip Augustus, about 1200. It was introduced into England in 1776 by George III., who created the duke of Argyll field marshal. The English field marshal, when unemployed, has the same daily pay as any other general; but when actually commanding he receives £16 8s. 9d. a day for staff duty, while a general receives £9 9s. 6d. In 1874 there were in Great Britain three field marshals, the duke of Cambridge (created in 1862), Sir W. M. Gomm (1868), and Sir George Pollock (1870). In Austria there were two field marshals, the archduke Albert and Prince Edmund von Schwarzenberg, and in Germany eight, of whom the prince of Saxony and Generals Moltke, Bittenfeld, and Steinmetz were appointed in 1871.

MARSHALL, the name of nine counties in the United States. **I.** A N. county of West Virginia, forming the base of the "Panhandle" between Ohio and Pennsylvania, and bordered on the W. by the Ohio river; area, 230 sq. m.; pop. in 1870, 14,941, of whom 120 were colored. It has a hilly surface and fertile soil. The Baltimore and Ohio railroad passes through it. The chief productions in 1870 were 131,638 bushels of wheat, 364,743 of Indian corn, 211,662 of oats, 54,781 of potatoes, 119,579 lbs. of wool, 204,480 of butter, and 5,750 tons of hay. There were 3,109 horses, 3,076 milch cows, 3,881 other cattle, 37,508 sheep, and 10,968 swine. Capital, Moundsville. **II.** A N. E. county of Alabama, intersected by the Tennessee river, and drained by its branches and the head waters of the Black Warrior; area, about 450 sq. m.; pop. in 1870, 9,871, of whom 1,367 were colored. The surface is mountainous, being traversed by ridges of the Appalachian system, and the soil is generally fertile. The chief productions in 1870 were 17,228 bushels of wheat, 187,491 of Indian corn, 67,116 of sweet potatoes, 5,477 lbs. of tobacco,

47,995 of butter, and 2,340 bales of cotton. There were 1,669 horses, 2,614 milch cows, 1,215 working oxen, 3,366 other cattle, 5,343 sheep, and 12,597 swine. Capital, Warrenton. **III.** A N. county of Mississippi, bordering on Tennessee, drained by the Tallahatchie, Tippah, and Coldwater rivers; area, 750 sq. m.; pop. in 1870, 29,416, of whom 16,499 were colored. It has an undulating surface and fertile soil. The Mississippi Central railroad intersects it. The chief productions in 1870 were 19,121 bushels of wheat, 765,466 of Indian corn, 29,111 of sweet potatoes, 81,350 lbs. of butter, and 18,379 bales of cotton. There were 2,809 horses, 4,058 mules and asses, 5,885 milch cows, 8,991 other cattle, 4,719 sheep, and 37,157 swine. Capital, Holly Springs. **IV.** A central county of Tennessee, intersected by Duck river; area, about 350 sq. m.; pop. in 1870, 16,207, of whom 4,385 were colored. It has a diversified surface and a generally fertile soil. The chief productions in 1870 were 126,633 bushels of wheat, 591,358 of Indian corn, 83,691 of oats, 16,182 of Irish and 16,556 of sweet potatoes, 12,788 lbs. of tobacco, 34,553 of wool, 170,658 of butter, and 2,063 bales of cotton. There were 6,202 horses, 2,598 mules and asses, 3,881 milch cows, 5,274 other cattle, 16,218 sheep, and 32,038 swine. Capital, Lewisburg. **V.** A W. county of Kentucky, bounded N. and E. by the Tennessee river and intersected by Clarke's river; area, about 350 sq. m.; pop. in 1870, 9,455, of whom 385 were colored. It has an undulating surface and fertile soil. The Elizabeth and Paducah railroad passes through it. The chief productions in 1870 were 40,708 bushels of wheat, 478,241 of Indian corn, 38,346 of oats, 16,891 of Irish and 19,598 of sweet potatoes, 1,416,282 lbs. of tobacco, 16,786 of wool, 138,881 of butter, and 90 bales of cotton. There were 1,331 horses, 1,019 mules and asses, 2,187 milch cows, 2,716 other cattle, 10,552 sheep, and 23,927 swine. Capital, Benton. **VI.** A N. county of Indiana, drained by the Yellow and Tippecanoe rivers; area, 440 sq. m.; pop. in 1870, 20,211. It has a level surface and fertile soil. Iron ore abounds. The Pittsburgh, Fort Wayne, and Chicago, and the Indianapolis, Peru, and Chicago railroads intersect it. The chief productions in 1870 were 319,798 bushels of wheat, 193,005 of Indian corn, 50,534 of oats, 84,994 of potatoes, 39,526 lbs. of wool, 243,583 of butter, and 13,689 tons of hay. There were 5,166 horses, 4,987 milch cows, 5,493 other cattle, 15,216 sheep, and 14,416 swine; 5 manufacturing hubs and wagon material, 2 of carriages, 2 of wooden goods, 1 brewery, 7 flour mills, 3 planing mills, and 42 saw mills. Capital, Plymouth. **VII.** A N. central county of Illinois, intersected by the Illinois river; area, 445 sq. m.; pop. in 1870, 16,956. It has an almost level surface and a fertile soil. The Peoria branch of the Chicago, Rock Island, and Pacific railroad intersects it, and the Illinois Central skirts the E. border. The chief

productions in 1870 were 107,029 bushels of wheat, 36,135 of rye, 1,122,903 of Indian corn, 362,604 of oats, 98,236 of potatoes, 20,819 lbs. of wool, 290,077 of butter, and 21,445 tons of hay. There were 9,798 horses, 5,533 milch cows, 6,904 other cattle, 5,517 sheep, and 20,098 swine; 2 manufacturing of agricultural implements, 13 of carriages, 4 of cooperage, 11 of saddlery and harness, 9 of tin, copper, and sheet-iron ware, 1 of woollen goods, 1 pork-packing establishment, 2 distilleries, and 4 flour mills. Capital, Lacon. **VIII.** A central county of Iowa, intersected by Iowa river; area, 576 sq. m.; pop. in 1870, 17,576. The surface is undulating and the soil fertile. It is intersected by the Chicago and Northwestern and the Central railroad of Iowa. The chief productions in 1870 were 922,560 bushels of wheat, 1,239,631 of Indian corn, 308,671 of oats, 99,881 of potatoes, 20,934 lbs. of wool, 405,972 of butter, and 25,439 tons of hay. There were 7,494 horses, 5,219 milch cows, 7,892 other cattle, 3,952 sheep, and 21,537 swine; 3 manufacturing of carriages and wagons, 1 of lime, 2 of machinery, 8 of saddlery and harness, 2 breweries, 4 saw mills, and 6 flour mills. Capital, Marshalltown. **IX.** A N. E. county of Kansas, bordering on Nebraska, and drained by the Big Blue river; area, 908 sq. m.; pop. in 1870, 6,901. It is intersected by the St. Joseph and Denver City railroad, and by the Central branch of the Union Pacific. The surface is somewhat diversified and the soil fertile. Coal and gypsum abound. The chief productions in 1870 were 160,750 bushels of wheat, 333,505 of Indian corn, 45,476 of oats, 42,488 of potatoes, 125,303 lbs. of butter, and 12,885 tons of hay. There were 2,534 horses, 3,025 milch cows, 4,383 other cattle, 2,379 sheep, and 2,909 swine; 3 flour mills, 2 saw mills, and 4 manufacturing of saddlery and harness. Capital, Marysville.

MARSHALL, a city and the county seat of Calhoun co., Michigan, situated on the Kalamazoo river and the Michigan Central railroad, 40 m. S. W. of Lansing, and 100 m. W. of Detroit; pop. in 1870, 4,925. It is surrounded by a fertile country, and has an important trade in agricultural products. There are several flour mills, saw mills, planing mills, manufacturing, and machine shops. Marshall has three national banks, with a capital of \$450,000; graded public schools, including a high school; two weekly newspapers, and 10 churches. It was laid out in 1831, and incorporated as a city in 1859.

MARSHALL, Humphrey, an American politician, born in Frankfort, Ky., Jan. 13, 1812, died in Louisville, March 28, 1872. He graduated at the military academy, West Point, in 1832, and entered the army as brevet third lieutenant of mounted rangers. After serving in the Black Hawk expedition, he resigned in 1833, and became a lawyer at Frankfort, and afterward at Louisville. He served in the Mexican war in 1846-'7, as colonel of the first Kentucky cavalry. In 1849 he was elected to

congress, and in 1852 appointed commissioner to China. In 1855 he was again elected to congress. In the civil war he was a major general in the confederate army.

MARSHALL, John, an American jurist, born in Fauquier co., Va., Sept. 24, 1755, died in Philadelphia, July 6, 1835. He was the eldest of 15 children of Col. Thomas Marshall, who signalized himself during the revolution, especially at the battle of Brandywine. The maiden name of his mother was Mary Keith. Col. Marshall was a gentleman of culture, and devoted himself personally to the training of his children. John thus obtained a strong love of English literature, especially for poetry and history. At the age of 12 he knew by heart a large portion of Pope's writings, and was familiar with Milton, Shakespeare, and Dryden. At the age of 14 he was sent to school at Westmoreland, where James Monroe was one of his fellow students. Returning home at the end of a year, he resumed his studies under the direction of a clergyman. His hours were still largely devoted to his favorite poets, and for many years he was full of dreamy romance and poetical enthusiasm. Field sports and athletic exercises in the open air were also habitual with him. He commenced the study of law at the age of 18; but the impending struggle with Great Britain drew him away from his books before he had obtained a license to practice. In 1775 he joined a military company, and when news came of the battle of Lexington, and the march of Patrick Henry upon Williamsburg, he addressed the company in eloquent terms, urging them to prepare for every emergency. After the flight of Dunmore he took part with his regiment, of which his father was major, in the battle of Great Bridge. Marshall was lieutenant of the flanking party which advanced in face of a murderous discharge from the enemy posted on the causeway, and terminated the engagement. His company was the "Culpeper minutemen," who wore green hunting shirts with "Liberty or Death" in white letters on the bosom, and whose banner displayed a coiled rattlesnake, with the motto, "Don't tread on me." In July, 1776, he was made lieutenant in the 11th Virginia regiment, on continental service, and marched to the north. In May, 1777, he was promoted to a captaincy. From the time of his entrance into the army to the close of 1779, Marshall was in active service. He took part in the engagement at Iron Hill, and in the battles of Brandywine, Germantown, and Monmouth. He shared the hardships and sufferings of the troops at Valley Forge with unvarying good humor and sanguine hopefulness. At this period he acted frequently as deputy judge advocate, and secured the warm regard of Washington. In the winter of 1779 he was sent to Virginia to take command of a new corps to be raised by the legislature. While this subject was under discussion, he attended a course of law lectures

delivered by Mr. Wythe at William and Mary college, and Bishop Madison's lectures on natural philosophy. In the ensuing summer he was licensed to practise law, but his military duties drew him back to the army. The project to raise additional forces in Virginia seems to have failed, and he set out alone and on foot to make the long journey to headquarters. On his arrival in Philadelphia his appearance was so shabby that the landlord of the hotel at which he stopped refused him admittance. He continued in the army until after the invasion of Virginia by Arnold in 1781, when, finding a redundancy of officers in the Virginia line, he resigned. At the close of the war he began practice as an attorney, and his success was marked from the commencement. The benevolence, placidity, and sweetness of his temper gained him a host of friends; and "that extraordinary comprehension and grasp of mind, by which difficulties were seized and overcome without difficulty or parade, commanded the attention and respect of the courts of justice." In 1782 he was a member of the house of delegates from Fauquier, and in the autumn of the same year was appointed one of the council of state. After his marriage in 1783 with Mary Willis Ambler, daughter of Treasurer Ambler, he resigned his seat in the executive council, and fixed his residence in Richmond. In spite of his removal from the county, his old neighbors reelected him a member of the house, and in 1787 he sat in the same body as representative from the county of Henrico. In June, 1788, the Virginia convention to act upon the constitution drawn up by the Philadelphia convention assembled, and Marshall was a member. He took a conspicuous stand by the side of James Madison, Edmund Pendleton, and other distinguished advocates of its acceptance. His defence of the constitution against its assailants was masterly. On three occasions, the debates on taxation, on the judiciary, and on the power over the militia, he gave full scope to his powerful logic and massive faculty of reasoning. The instrument was finally accepted by a vote of 89 to 79. Marshall and Madison were justly regarded as having done more for the adoption of the federal plan of government than any other members of the convention. The legislature having in 1788 directed that hereafter the city of Richmond should be entitled to a representative in the house, Marshall was elected, and continued to sit in the assembly during the sessions of 1789, 1790, and 1791. Virginia was the headquarters of the state rights party, whose views were represented in the national cabinet by Thomas Jefferson; and a majority of the people of the commonwealth were opposed to the measures of the administration. The great question whether the United States constitution should be strictly or liberally construed was the point at issue. Marshall supported the federal view with the calmness and moderation of tone which characterized him,

but with all the vigor which his friends had expected. When in 1792 he retired from the body, he left not an enemy behind him. From 1792 to 1795 he devoted himself exclusively to his practice, which had greatly increased. In 1793 he appeared prominently in public meetings on the side of the administration of Washington, and defended the proclamation of neutrality occasioned by the insolent conduct of Genet, the French minister. He also advocated Washington's policy with his pen, and secured the passage by a meeting of the citizens of a set of resolutions approving it, which he had drafted. In 1795 he sat again in the house of delegates. In the violent discussions on Jay's treaty, Marshall appeared as its champion; and before an assembly of citizens who had denounced the proposed measure he defended it so powerfully that they reversed their former action, and adopted resolutions in favor of the federal policy. In the legislature he opposed the resolutions condemnatory of the treaty in a speech which is represented to have been one of the greatest and noblest of his performances. The result was that the constitutional ground of objection was abandoned, and the assembly confined itself simply to an expression of its disapprobation of the treaty on the ground of its inexpediency at the time. Washington offered Marshall the place of attorney general, which he declined, as interfering with a practice at the bar which had now become very lucrative. In 1796 he was offered the appointment of minister to France, but declined it for the same reason. Gen. Pinckney was appointed in his place, but the French directory refused to receive him; and in 1797 President Adams sent a new commission to Marshall, who yielded his objections, and with Pinckney and Gerry proceeded as envoy extraordinary to Paris, to negotiate with the directory in relation to the obstructions thrown in the way of the commerce of the United States. These negotiations failed; but the envoys, returning in June, 1798, were received with approval and applause. In New York Marshall was honored with a military escort, and crowds thronged his lodgings, to testify their gratitude and respect. Public addresses were offered him, and a public dinner by members of both houses of congress. Marshall had faithfully reflected the views of the administration and the federal party of the country generally, in his official acts; and he approved of the series of measures directed against France, which were so violently opposed by the republicans. He returned to the practice of the law, but was soon again urged to appear in defence of his party. Washington sent for him to visit him at Mount Vernon, and he finally consented to run for congress, and was elected in 1799 by a small majority. During the canvass, Adams offered him a seat on the bench of the United States supreme court, which he declined. In congress he became the main stay and reliance of the administration, though he seems not to have approved

of the alien and sedition laws, voting for the repeal of the most obnoxious sections of the latter. Virginia had recorded her solemn protest, in the resolutions passed by her assembly in the winter of 1798, against these laws, and had established arsenals and armories to defend her rights by force if necessary. Washington, the great bulwark of the federal party, was no longer at the head of government, and the republicans were flushed with the daily increasing revulsion against the federal administration. At this crisis Marshall appeared in congress as the federal leader. In the debates upon great constitutional questions he was confessedly the first man in the house. The great event of his career in congress was his speech in defence of the administration in the affair of Jonathan Robbins. This person had committed a murder on board a British frigate, and fled to the United States. On the requisition of the British minister, who alleged that Robbins was a subject of Great Britain, he was surrendered by President Adams, in compliance with a clause in Jay's treaty. For this the opposition in congress furiously assailed the president. Mr. Livingston introduced a resolution of censure on him for the surrender of Robbins at the dictation of the British minister, and upon this resolution took place an animated debate. The speech which he made on this occasion is the only one that Marshall ever revised, and is that by which he is best known to the world. It demonstrated that the surrender was an act of political power which belonged to the executive. Judge Story says the speech silenced opposition, and settled then and for ever the points of national law upon which the controversy hinged. In May, 1800, Marshall was appointed secretary of war, but before his entry on the duties of the office was offered the place of secretary of state, which he accepted. In this capacity he conducted several important discussions with the British minister, and drew up the instructions to Mr. King, the American minister to London, which hold a prominent place among the great state papers of the country.—On Jan. 31, 1801, he was appointed by President Adams chief justice of the United States supreme court, and the senate unanimously confirmed the appointment. In this great tribunal of ultimate resort his influence is known to have been paramount. In 1804-'7 Judge Marshall published a "Life of Washington" (5 vols.), largely based upon unpublished official documents, in which he defended the course of Washington's administration against the assaults of the republican party. The first volume was published separately in 1824, as "A History of the American Colonies;" and in 1832 the whole work was revised and compressed into two volumes. In 1828 Judge Marshall was a delegate from Richmond to a convention held in Charlottesville for devising a system of internal improvements, to be recommended to the legislature. In 1829 he represented Richmond in the reform conven-

tion to revise the old constitution of the commonwealth. For many years he had been suffering greatly from a disease of the bladder. A surgical operation procured him relief, but a hurt received in travelling brought on an attack of liver complaint. He went to Philadelphia for medical assistance, but the disease overpowered him.—In person Marshall was ungraceful, and in dress and bearing presented the appearance of a plain countryman. Mr. Wirt describes him as "tall, meagre, emaciated; his muscles relaxed, and his joints so loosely connected as not only to disqualify him apparently for any vigorous exertion of body, but to destroy everything like harmony in his air or movements." In spite, however, of this ungainliness and simplicity, no one was a greater social favorite. His great passion was the game of quito; and he was a member of the club which met at Buchanan's Spring, near Richmond, to play at it. He was the centre of a brilliant circle of wits; but he was an unaffected Christian, and in a time of skepticism he never uttered a word to throw doubt upon Christianity.—A selection from his decisions has been published, entitled "The Writings of John Marshall, late Chief Justice of the United States, upon the Federal Constitution" (Boston, 1839).

MARSHALL, Thomas Francis, an American politician, nephew of Chief Justice Marshall, born in Frankfort, Ky., June 7, 1801, died near Versailles, Ky., Sept. 22, 1864. In 1831 he removed to Louisville, where he soon gained an extensive legal practice, was a member of the legislature successively from Jefferson and Woodford counties, and for several years was judge of the Louisville circuit court. From 1841 to 1843 he was a member of congress. In January, 1842, when John Quincy Adams, under protest and in deference only to the right of petition, presented a memorial of certain citizens of Haverhill, Mass., asking congress to dissolve the Union, Marshall moved a vote of censure, and Mr. Adams's reply subjected him to much ridicule. Though he had entered congress as a whig, he opposed Mr. Clay's United States bank bill, and subsequently favored the annexation of Texas and the election of Polk to the presidency. As a public speaker he was remarkable for his ready repartee and satire, and at different times was involved in four duels, one of them with James Watson Webb, then editor of the New York "Courier and Enquirer." During the latter years of his life he lectured successfully on history and other subjects through the northern and eastern states, and at intervals on temperance, though during the greater part of his life his own habits were intemperate. A collection of his writings and speeches has been edited by W. L. Barre (8vo, Cincinnati, 1858).

MARSHALL, William Calder, a Scottish sculptor, born in Edinburgh in 1813. He studied in London under Chantrey and Baily, visited Rome in 1836, and passed some years in Italy. In 1835 he first exhibited at the royal academy,

and in 1839 took up his residence in London. He was elected an associate of the Scottish academy in 1844, and a royal academician in 1852; and he was employed as one of the three sculptors for the new houses of parliament. In 1857 he obtained the first prize of £700 for a design for a national monument to the duke of Wellington, and he is now (1874) executing in marble part of a series of bass reliefs for the chapel in St. Paul's cathedral, in which that monument is to be placed. His more important works are: "The Broken Pitcher," exhibited in 1842; "First Whisper of Love," 1845; "The Dancing Girl Reposing," which obtained the art union premium of £500; "Sabrina," 1847; the statues of Clarendon and Somers for the houses of parliament, of Sir Robert Peel at Manchester, of Jenner in Trafalgar square (1859), of Campbell, of Crompton, the inventor of the mule spinning machine, of James, seventh earl of Derby, at Bolton, and of Sir George Grey in Cape Town, Africa.

MARSH HAWK. See HARRIER.

MARSH HEN. See RAIL.

MARSH MALLOW. See ALTHÆA.

MARSHMAN, Joshua, an English missionary, born at Westbury-Leigh, Wiltshire, in 1767, died in Serampore, India, Dec. 5, 1837. In 1799 he was sent out to Serampore by the Baptist missionary society. He applied himself to the study of Bengalee, Sanskrit, and Chinese, in 1826 visited England, and returned to India in 1829. His principal works are: a Chinese translation of the book of Genesis, the four Gospels, and the Epistles of Paul to the Romans and Corinthians; a "Dissertation on the Characters and Sounds of the Chinese Language" (1809); "The Works of Confucius, containing the Original Text with a Translation" (1811); "Clavis Sinica: Elements of Chinese Grammar," &c. (Serampore, 1814); and "A Defence of the Deity and Atonement of Jesus Christ" (London, 1822), in reply to a work of Rammohun Roy, discrediting the miracles of Christ. He assisted Dr. Carey in preparing a Sanskrit grammar and a Bengalee and English dictionary, and published an abridgment of the latter in 1827.

MARSH RABBIT. See HARE.

MARSI. I. An ancient people of Italy, of Sabine race. They dwelt in the central Apennines, their territory surrounding Lake Fucinus (now Lago di Celano), where they bordered upon the Sabines and Vestini to the north, the Peligni toward the east, the Samnites and Volscians to the south and southwest, and the Æqui and Hernici to the west. Their principal town was Marruvium or Maruvium (San Benedetto), on the E. bank of the lake. Their origin is ascribed by some legends to Marsyas of Phrygia, and by others to a son of the sorceress Circe, probably from their acquaintance with the medicinal qualities of some plants growing among the mountains of their territory, which were used as remedies against the bites of snakes. The Marsi en-

joyed a great reputation for bravery among the Romans, against whom they fought in alliance with their neighbors, the Peligni, Marucini, and other Sabellian tribes, in the latter part of the 4th century B. C., finally concluding a peace in 304. Having been for about 200 years the staunch allies of the republic, they became the prime movers of the great war known as the social or Marsic, waged for the right of the Roman franchise, which, though often defeated, they finally secured. It was proverbial among the Romans that "no triumph can be obtained over the Marsi or without them." II. An ancient people of Germany, on the banks of the Ems, probably a tribe of the Cherusci, with whom they fought under Arminius.

MARSIGLI, Luigi Ferdinando, count, an Italian naturalist, born in Bologna, July 10, 1658, died there, Nov. 1, 1730. He studied mathematics and natural history under Borelli and Malpighi, travelled in Turkey, afterward served in the imperial army, was wounded and captured by the Turks in the battle of Raab (1683), was ransomed by his family, and after the conclusion of peace was employed as boundary commissioner between Turkey and Austria. In the war of the Spanish succession, being second in command of the garrison at Breisach (1703) when that place surrendered to the French without offering any resistance, he was tried by an Austrian court martial and deprived of his rank in the army. Devoting himself henceforward to scientific pursuits, he travelled in the west of Europe, finally settling in his native city. He published *Saggio fisico intorno alla storia del mare* (1711), *De Generatione Fungorum* (1717), *Danubius Pannonico-Mysicus* (1726), and *Stato militare dell' imperio Ottomano* (1732). In England he became a friend of Newton and Halley, and a member of the royal society. He presented his scientific collection to Bologna, and his printing press, with types for Latin, Greek, Hebrew, and Arabic, to the Dominicans of that city.

MARS-LA-TOUR, a village of France, in the department of Meurthe-et-Moselle, 18 m. W. of Metz, on the road to Verdun and Paris. It is celebrated for a battle fought here and at Vionville, Aug. 16, 1870, in which Prince Frederick Charles achieved a great strategical victory over Bazaine, who by this defeat was prevented from leaving Metz. The fighting was obstinate, and during a part of the day the Germans were opposed to vastly superior forces. Their losses were estimated at 640 officers and 15,170 men; the French lost 879 officers and 16,128 men. The greater part of the battle field is in the territory ceded to Germany, the new boundary line being in the immediate vicinity of the French village.

MARSTON, John, an English poet, born about 1570, died about 1634. He was educated at Corpus Christi college, Oxford, and entered the Middle Temple, London, where he was chosen lecturer in 1593. He was intimate with

Ben Jonson, to whom he dedicated in 1605 his tragi-comedy, "The Malcontent." Associated with Jonson and Chapman in writing "Eastward Ho!" he was with them imprisoned for a short time by James I. on account of its reflections against the Scotch. He also wrote "The Scourge of Villainy," "The Metamorphosis of Pigmalion's Image," "Antonio and Mellida," "Antonio's Revenge," "The Dutch Courtesan," and "Parasitaster." An edition of Marston's works, containing six tragedies and comedies, was published in London in 1633; a new edition, with notes and a memoir, was published by J. O. Halliwell (3 vols., London, 1856).

MARSTON, Westland, an English author, born in Boston, Lincolnshire, Jan. 30, 1820. He received a legal education in the office of his uncle, a solicitor in London, but relinquished the law for dramatic authorship. Among his best plays are the tragedies of "The Patrician's Daughter" (1841), "The Heart and the World" (1847), "Strathmore" (1849), "Philip of France" (1849), and "Anne Blake" (1852), several of which possess poetic merits of a high order. He has also produced some comic dramas. His more conspicuous later works are: "Pure Gold," "Donna Diana," "The Favorite of Fortune" (1866), "A Hero of Romance" (1867), and "Life for Life" (1868). He has also published some lyrics in periodicals, a volume of poems (1842), "A Lady in her own Right," a novel (1860), and a collection of his contributions to periodicals under the title of "Family Credit, and other Tales" (1861).

MARSTON MOOR, a large open plain of Yorkshire, England, 8 m. N. W. of York, where a decisive victory was gained by the parliamentary forces and the Scots, under Lord Fairfax and the earl of Leven, over the royalists commanded by Prince Rupert, July 2, 1644. The advance of the royalists toward York, which was invested by Fairfax, having compelled the latter to raise the siege, he retired to Marston Moor, where Rupert encountered him on the afternoon of July 2 with 25,000 men. The parliamentary army was of about equal strength. The battle commenced with an ineffectual cannonade on both sides, after which a pause of two hours ensued, each army watching the other across a brook. At 7 o'clock in the evening the signal for close combat was given, and Rupert, who commanded the right wing of the royalists, falling impetuously upon the parliamentary left wing, routed it, and pursued the fugitives several miles. The parliamentary centre was in like manner driven back by the royalist infantry with great loss, and the fortune of the day seemed so desperate that the three parliamentary generals, Lord Fairfax and the earls of Manchester and Leven, fled in different directions. But the imprudence of Rupert ruined his cause. That part of the parliamentary left consisting of Cromwell's brigade of ironsides and David Leslie's Scottish regiments, with some fugitives

rallied by Sir Thomas Fairfax, taking advantage of the disordered condition of the cavaliers, who were scattered in pursuit or engaged in plundering the baggage of their enemies, charged them in a compact body with such vigor that after a few brief shocks the royal army was driven from the field, and its artillery, consisting of 25 pieces, with more than 100 colors and 1,500 prisoners, captured. The royalist loss in killed and wounded exceeded 2,000, and that of the parliamentary army was nearly as great. A few days afterward York surrendered to Fairfax, and the power of the parliament was permanently established in the north of England.

MARSTRAND, Wilhelm, a Danish painter, born in Copenhagen, Dec. 24, 1810, died there, March 25, 1873. He studied at the academies of Copenhagen and Munich and in Rome. His "Return of a Society from a Popular Festival" made him famous as a genre painter; and his reputation was increased by his "Parlor," "Political Gossip," "Erasmus Montanus," and other pictures after the manner of Holbein. He was a professor at the academy of Copenhagen for more than 20 years, and its director for six years.

MARSUPIALS, an order of implacental mammals, all, with the exception of the American opossums, now confined to Australia and its archipelago. The name is derived from the presence of a *marsupium* or abdominal pouch in the females for the protection of their immature young, supported by two supplementary bones attached to the anterior margin of the pelvis. The cerebral characters have been described under MAMMALIA, and the peculiarities of the marsupial lactation under KANGAROO. They have been divided into two sections, according to the character of their food, the phytophagous or plant-eating and the rapacious or carnivorous and insectivorous groups. The former are characterized by the small size or absence of canine teeth, the large incisors (never more than two in the lower jaw); and broad tubercular molars; they include the three families of *phascologydæ* or wombats, *macropodidæ* or kangaroos, and *phalangistidæ* or phalangers and koala. The second group have small and numerous incisors, eight to ten in the upper and six to eight in the lower jaw, canines large and in both jaws, and pointed molars; they include the four families of *peramelidæ* or bandicoots, *didelphidæ* or opossums, *myrmecobiidæ* or Australian ant-eaters, and *dasyuridæ* or dasyures, the last the most carnivorous of all in habits and form. This order presents animals showing types of many of the placental orders; for instance, the phalangers call to mind the *quadrumana*, the dasyures the *carnivora*, the phascogales the *insectivora*, and the kangaroos the *edentata*. Though Australia is the great headquarters of the marsupials, they are found in America from the middle United States to Buenos Ayres, as well as on the W. coast of

South America; those species in Australia nearly allied and with similar habits do not appear to be associated in the same limited district.—The skull in marsupials presents the reptilian character of permanent separation of the bones, even in old animals; the palate is very imperfect, and the angle of the jaw bent inward; the number of teeth is greater than in placental mammals, and that of the incisors is never the same in each jaw; clavicles are present in most of the species; the marsupial bones, existing in both sexes, are considered by Owen as trochlear or sesamoid bones, developed in the tendon of the external oblique muscle of the abdomen as the knee-pan is in the tendon of the *rectus* of the thigh, the cremaster muscle winding around them in the male and the compressors of the mammary gland in the female; in many genera, like the opossums, the tibia and fibula are so loosely connected with each other and with the tarsus that the foot has a movement of rotation upon the leg, the inner toe acting as an opposable thumb. The brain, relatively to the body, is smaller in marsupials than in any other mammals, varying between 1 to 520 and 1 to 800; its structure is more simple, and its surface without convolutions or *corpus callosum*, and the intelligence corresponds to this inferiority of cerebral development. The organs of smell, hearing, and other senses are well developed; the eyes are generally large and prominent, as most of them are nocturnal in their habits. There are three modifications of the stomach, it being simple in the opossums and phalangers, with a glandular apparatus in the koala and wombat, or sacculated in the kangaroos (in the latter resembling in structure the human colon); these modifications do not appear to be related to the character of the food; in the genera with a simple stomach the cæcum is much developed, being sometimes three or four times as long as the animal, while it is very small in those with sacculated complex stomachs, showing the vicarious functions of these two portions of the alimentary canal; in the flesh-eating marsupials the intestine is suspended on a simple and continuous mesentery, as in carnivorous reptiles. The liver is divided into many lobes, and is always provided with a gall bladder; the pancreas and spleen are triangular or T-shaped; in the heart there is not the usual trace of the fetal communication between the auricles, on account of the early period at which the incompletely developed young begin to respire air. The lungs are constructed on the usual mammalian type, the only tendency to the oviparous structure being the entireness of the rings of the trachea in some of the phalangers; the kidneys present nothing unusual; the membranous portion of the urethra is longer and wider than in other mammals; the *vesicula seminales* are absent, and the glands sometimes double, with a corresponding duplication in the female organs; in these ovo-viviparous or implantal mam-

mals the vascular layer of the allantois is not developed so as to organize the villi of the chorion or to form cotyledons or a placenta. For details on the anatomy, mode of development, and natural history of marsupials, the reader is referred to the article "Marsupialia," by Owen, in vol. iii. of the "Cyclopædia of Anatomy and Physiology," and to vol. i. of the "Natural History of Mammalia," by G. R. Waterhouse (London, 1846). Prof. Owen regards the koala as the most typical of the marsupials, having the greatest number of the modifications peculiar to the order, and the smallest number of those common to other groups of mammals. His classification of the order is into: 1, *sarcophaga* (flesh eaters), like *dasyurus*; 2, *entomophaga* (insect eaters), like the opossums; 3, *carpophaga* (fruit eaters), like the phalangers; 4, *poëphaga* (plant eaters), like the kangaroos; and 5, *rhizophaga* (root eaters), like the wombat.—The first traces of mammals on the globe are the fossil remains of marsupials in the Stonesfield oolite and the gypsum (eocene) of Paris, so that at those epochs Europe was inhabited by animals of a type now confined to Australia and America; similar fossils have been found in the caverns of Wellington valley, New South Wales, and in the calcareous caverns of Brazil by Dr. Lund, very nearly allied to species now living in those countries.

MARSUS, Domitius, a Roman poet of the Augustan age, of whose life there are no particulars; but he survived Tibullus, who died in 18 B. C. He is frequently mentioned by Martial, who praises his epigrams, which are remarkable for their licentiousness; and he also wrote epic poetry, erotic elegies, and a collection of fables. His fragments are inserted in Weichert's *Poetarum Latinorum Reliquiæ* (Leipsic, 1830).

MARSYAS, in Greek mythology, according to different traditions, a satyr or a peasant of Phrygia, son of Hyagnis, Cægrus, or Olympus. A flute, which Minerva had thrown away in disgust at seeing the distortion of her features, as she played it, reflected in the water, was picked up by Marsyas. The breath of the goddess, having once filled it, caused it still to emit the most beautiful strains whenever he blew through it. He challenged Apollo to a musical contest, and played the flute while Apollo played the lyre. The latter triumphed only by adding his voice to the music of his instrument. The condition was that the victor should do what he pleased with the vanquished, and Marsyas was bound to a tree and flayed alive. His blood was the source of the river Marsyas in Phrygia, an affluent of the Mæander; and his flute or flutes (for, according to some, he played on the double flute), being borne down this river, were thrown on shore near Sicyon, and there dedicated to Apollo in his temple. The legend is supposed to have reference to the contest between the citharædic and anædic styles of music. Marsyas is made by some the inventor of the flute.

MARTEL, Charles. See CHARLES MARTEL.*

MARTEN, a carnivorous animal of the weasel family, and genus *mustela* (Linn.), which includes also the fisher and the sable of Europe. The pine marten or American sable (*M. Americana*, Turton) is smaller than the fisher, being about 17 in. from the tip of the nose to the base of the tail, the latter being 10 in. to the end of the hairs; it is also less common and considerably more valuable. The general color is a rusty yellow, with a lighter head, almost whitish throat, and dark tints on the back, varying according to season, latitude, and locality; the tail is cylindrical, bushy, and comparatively short; the inner fur is ash-colored at the base, yellowish brown near the end, and in the best specimens tipped with dark brown or black; it is coarse and light-colored in summer and in low latitudes, but in the Hudson bay and Lake Superior districts the winter fur is fine, long, lustrous, and darker, the tail generally the darkest. It is shy, cunning, and very active, rarely approaching the haunts of man, preferring the dense pine woods of northern latitudes; it is carnivorous and pursues its



Pine Marten (*Mustela Americana*).

prey into trees. It is generally taken in winter in dead-falls, set about a quarter of a mile apart and baited with a piece of meat or fish; the winter traveller in the mining region of Lake Superior, in following the Indian trails, sees many of these traps containing the dead and frozen victims. This marten is properly called the American sable, though the mink, of inferior value (of the genus *putorius*, Cuv.), is by furriers erroneously called by this name; the fur is sometimes dyed and sold as Russian sable, when of very fine quality. (See FUR.) It has been questioned whether the pine marten of Europe (*M. martes*, Linn.) is the same as the American; it is probably a distinct species, and is so regarded by Prof. Baird. The northern limit in America, according to Richardson, is 65° N., where trees cease; the absence of trees, and consequently of the marten, according to Pennant, for 25 degrees of longitude on the Asiatic side of Behring's straits, is in favor of the non-identity of the two species; the same facts would add to the improbability of the true sable (*M. zibellina*, Linn.) being found in this country; the south-

ern limit, according to Audubon and Bachman, is about 40°, and its range extends from the Atlantic to the Pacific. The European pine marten is grayish brown, with a yellow spot under the neck. The beech marten (*M. foina*, Linn.) has a white spot on the throat, the body more reddish and yellowish brown, the tail brownish black, and the downy fur of all parts of a lighter hue. The sable is described under its proper title. The martens have one more carnivorous tooth than the polecats, and are less sanguinary in their habits, eating when pressed more vegetable food; they are generally wild, inhabitants of woods, climbing trees in pursuit of birds, squirrels, and other small animals; they are all nocturnal, preferring cold and uninhabited regions; all are valuable for their fur, that of the sable being most prized, next that of the pine marten of America, then of the common and beech martens of Europe, and last of the American fisher.

MARTENS. I. Georg Friedrich von, a German publicist, born in Hamburg, Feb. 22, 1756, died in Frankfort, Feb. 21, 1821. He studied at Göttingen, where he became in 1784 professor of jurisprudence, was ennobled in 1789, and was employed in various public capacities, serving during the five years previous to his death as Hanoverian minister at the German diet. His reputation rests on his *Précis du droit des gens moderne de l'Europe* (3d ed., Göttingen, 1821), and his *Recueil de traités* (7 vols., 1791-1801, and a supplement in 4 vols., 1802-'8), the latter of which, with continuations by other writers, includes treaties of 93 years, from 1761 to 1854. He also wrote *Cours diplomatique, ou tableau des relations extérieures des puissances de l'Europe* (3 vols., Berlin, 1801), and several other kindred works. **II. Karl von**, a German diplomatist, nephew of the preceding, born in Frankfort about 1790, died in Dresden, March 28, 1863. In the latter part of his life he represented the grand duke of Saxe-Weimar at the court of Saxony. His principal works are: *Guide diplomatique* (5th ed., 2 vols., Leipsic, 1866), originally entitled *Manuel diplomatique* (1821); *Causes célèbres du droit des gens* (2d ed., 5 vols., 1858-'61); and, jointly with Cussy, *Recueil manuel et pratique de traités* (7 vols., 1846-'57).

MARTHA'S VINEYARD, an island lying off the S. coast of Massachusetts, and forming the principal portion of Dukes co. With Chapquiddick island, which lies immediately adjacent at its E. extremity and may be considered a portion of it, it is divided into four towns, Chilmark, Edgartown, Gay Head, and Tisbury; aggregate population in 1870, 3,688. At Gay Head there is a remnant of the former Indian possessors of the island, now mostly mixed with negro blood. Edgartown is 14 m. S. by E. of Wood's Hole on Cape Cod, 25 m. W. by N. of Nantucket, 30 m. S. E. of New Bedford, and 75 m. S. E. of Boston. Martha's Vineyard, which is separated from the mainland by Vineyard sound, is 21 m. long and 6 m. in

average breadth. The surface is generally level, though there are elevations rising to the height of 150 ft. above the sea. The promontory of Gay Head, at the S. W. extremity, is 134 ft. above high water, and is much visited. On it there is a lighthouse (lat. $41^{\circ} 20' 52''$ N., lon. $70^{\circ} 49' 47''$ W.), showing a white flashing light, 170 ft. above the sea. The soil is generally light, and a great part of the surface is covered with low forests. The inhabitants are chiefly engaged in navigation and fishing.—Martha's Vineyard was discovered by Bartholomew Gosnold in 1602, though he gave the name, not to the island which now bears it, but to a neighboring islet which is now called No Man's Land. In 1642 Martha's Vineyard was settled by Thomas Mayhew, who had been a merchant at Southampton, England. In 1644 it was placed under the jurisdiction of Massachusetts, and in 1664 it was transferred to New York, but was restored to Massachusetts in 1692. It suffered much during the revolutionary war from the British, who plundered it of 2,000 head of cattle. It has of late years become noted for its annual camp meetings and as a summer resort. (See EDGARTOWN.)

MARTIAL (MARCUS VALERIUS MARTIALIS), a Latin epigrammatic poet, born in Bilbilis, Spain, March 1, A. D. 43, died near the same place in or after 104. Little is known of his history except from his works, the younger Pliny being the only contemporary author who mentions him. He went to Rome in 66, resided there 35 years, and then returned to Bilbilis, where he lived at least three years. While in Rome the fame of his epigrams caused them to be sought not only in the capital, but also in Gaul, Germany, and Britain; he enjoyed the patronage and favor of the emperors Titus and Domitian; was raised to the rank of tribune and of knight; and had a mansion in the city, and a villa near Nomentum. His extant works consist of more than 1,500 short poems, in 14 books, bearing the general title of *Epigrammata*. The last two books, consisting of 350 distichs, are named respectively *Xenia* and *Apophoreta*. Still another book, containing 33 epigrams on the public shows, and bearing only in late MSS. the title of *De Spectaculis*, is attributed to him. The term epigram had previously been applied to any brief metrical effusion of whatever character, on whatever subject, and thus to the whole mass of the Greek anthology. Martial was the first to limit its meaning to a short poem, abounding in ingenious and pointed thoughts, all of which converge to a pithy and striking conclusion. He displays a singularly fertile fancy, a pungent wit, and refinement and delicacy of diction. No author has furnished a more full and minute delineation of Roman customs and social habits during the first century of the empire. But he lavishes adulation upon Domitian, and delights in obscenity. Among the best editions are those of Lemaire (3 vols., Paris, 1825) and Schneidewin (Grimma, 1842). Selections from

his epigrams have been translated by several English poets, but the only complete version is that by various authors in Bohn's "Classical Library" (London, 1860). There is a German translation by Ramler. Martial, with a French translation, is contained in Nisard's edition of the Latin authors (Paris, 1842); and a translation by several hands, with a memoir by Jules Janin, was edited by Lemaistre and Du-bois (2 vols., 1864).

MARTIAL LAW, a term often confounded with military law, but in fact quite distinct from it. Military law, besides some customary law, consists chiefly of the articles of war; that is to say, of the code enacted by the supreme legislative authority for the government of the army and navy. It embraces, also, the body of rules and regulations which are prescribed from time to time by competent military authority, for the preservation of the general discipline and order. Military law does not supersede the general municipal law; it is rather a branch of it, more limited in the range of its application than the admiralty or the chancery law, for example, yet having a like authority with them. In this country, unlike some of the states of continental Europe, the application of military law to the soldier is not exclusive of, but coordinate with, the general civil law. Every soldier, as a citizen, is subject to the common law of the land; but as a soldier he is amenable to the military law. The special tribunals which administer this law are named courts martial, and hence perhaps has arisen in part the confusion of the military law with the law martial. (See COURT MARTIAL.) Martial law, says Blackstone, is in fact no law at all. Smith, in his "English Republic," says: "Martial law is the law of war, that depends on the just but arbitrary power and pleasure of the king. For, though he doth not make any laws but by common consent in parliament, yet in time of war, by reason of the necessity of it, to guard against dangers that often arise, he useth absolute power; so that his word is a law." However opposed to other authorities, this expresses what is distinctively meant both in England and in this country by martial law. When in time of extreme peril to the state, either from without or from within, the general safety cannot be trusted to the ordinary administration, or the public welfare demands the adoption and execution of extraordinary measures, it may become necessary to declare the existence of martial law. This is, indeed, no law at all in its ordinary sense; it is in fact the abrogation of it. That which is done under martial law has not an immediate constitutional or legislative sanction, as the military or the statute law has. It proceeds directly from the military power, which has now become supreme. The supreme court of the United States has held that a state legislature may proclaim its existence whenever the public safety demands it; and the constitution, by implication at

least, also permits its proclamation by that clause which provides that the privileges of the writ of *habeas corpus* shall not be suspended, unless when, in cases of rebellion or invasion, it is essential to the general welfare. The right to judge whether the exigency has arisen belongs, it seems, exclusively to congress. So in England martial law and its incident, the suspension of the writ of *habeas corpus*, require the authority of parliamentary acts to give them a constitutional existence. The supreme court of the United States also held in Milligan's case (4 Wallace, 2), that martial law could not be permitted, even during the existence of a civil war, to displace the ordinary administration of law in a state not invaded and not engaged in rebellion, and where the courts were open and in the proper and unobstructed exercise of their functions; and that the guaranty of jury trial in the constitution would make void all trials and sentences by military tribunals in such states of citizens not in military or naval service. And neither the president, nor congress, nor the judiciary, it was held, could take from the citizen the benefit of such guaranty under the circumstances stated.

MARTIN, an American bird, the largest of the swallow family, belonging to the genus *progne* (Boie). The bill is strong and short, with a very wide gape and curved culmen; the wings lengthened, the first quill the longest; the tail moderate, but considerably forked; tarsi shorter than the middle toe and robust; the toes long and strong, the lateral ones equal, with curved claws. The best known is the purple martin (*P. purpurea*, Boie), generally



Martin (*Progne purpurea*). 1. Female. 2. Male.

distributed over North America; the length is $7\frac{1}{2}$ in., the extent of wings 16 in., and the bill along the gape 1 in.; the general color is glossy steel blue, with purple and violet reflections; the female and young are less brilliant, and pale brownish below with darker and bluish

blotches; the bill brownish black; the closed wings are rather longer than the tail, and the tarsi and toes are naked. Martins appear in Louisiana early in February in large flocks, in the middle states from the middle of March to the 10th of April, in New England about the 25th of April, and further north at a later period, departing for the south again about the 20th of August in immense flocks and all at once at the dawn of some calm morning. The flight is graceful, easy, and swift; they are expert in catching their insect prey, in bathing and drinking while on the wing, and in performing aerial evolutions to the annoyance of their bird enemies; they are very bold, and do not hesitate to attack crows and hawks, which from their superior powers of flight they drive away; even the fierce little king bird (sometimes called field martin), with similar fighting propensities, has to yield to the strong and swift martin; they perch easily upon trees, and, notwithstanding the shortness of their legs, walk well upon the ground. From their attacking cats, dogs, and all flying marauders of the farm yard, they are great favorites, and are provided with elevated boxes for rearing their young in most towns of the United States; these harbingers of spring are much attached to their breeding places, and return to the same year after year; in the absence of a box, they build in any crevice or hole in a tree. The nest is made of leaves, twigs, grasses, feathers, and other soft materials, and generally contains four to six pure white eggs; many pairs breed in the same box in perfect harmony; two broods are generally reared in a season; the males assist in incubation. The food consists of wasps, bees, beetles, and other insects, though they seldom seize the honey bee. In England some of the swallows are called martins; these, as the house martin (*chelidon urbica*, Boie), and the sand or bank martin (*cotyle riparia*, Boie), are noticed under SWALLOW.

MARTIN. I. An E. county of North Carolina, bounded N. by the Roanoke river; area, 420 sq. m.; pop. in 1870, 9,647, of whom 4,583 were colored. The surface is level and the soil generally sandy. The chief productions in 1870 were 206,384 bushels of Indian corn, 47,799 of sweet potatoes, and 3,607 bales of cotton. There were 696 horses, 566 mules and asses, 1,232 milch cows, 2,738 other cattle, 2,253 sheep, and 11,630 swine. Capital, Williamston. **II.** An E. county of Kentucky, formed since the census of 1870, separated from West Virginia by the Tug fork of Sandy river; area, about 250 sq. m. The surface is mountainous and well timbered. Capital, Warfield. **III.** A S. W. county of Indiana, drained by the E. fork of White river and by Lick creek; area, 340 sq. m.; pop. in 1870, 11,103. The surface is hilly and the soil moderately fertile. The Ohio and Mississippi railroad intersects it. The chief productions in 1870 were 102,288 bushels of wheat, 360,680

of Indian corn, 72,894 of oats, 21,588 of potatoes, 50,079 lbs. of tobacco, 89,501 of wool, 120,481 of butter, and 3,241 tons of hay. There were 3,267 horses, 2,357 milch cows, 3,674 other cattle, 17,071 sheep, and 14,976 swine; 2 distilleries, 6 flour mills, and 7 saw mills. Capital, Dover Hill. **IV.** A S. county of Minnesota, bordering on Iowa, drained by the head waters of Blue Earth river and of the E. fork of the Des Moines, and containing numerous small lakes; area, 720 sq. m.; pop. in 1870, 3,867. It has a rolling surface and a fertile soil. The chief productions in 1870 were 99,565 bushels of wheat, 39,149 of Indian corn, 107,042 of oats, 25,094 of potatoes, 114,473 lbs. of butter, and 11,689 tons of hay. There were 1,114 horses, 3,223 cattle, 749 sheep, and 1,039 swine; 2 flour mills, and 2 saw mills. Capital, Fairmount.

MARTIN, the name of five popes, of whom the following are the more important. **I. Martin I., Saint**, born at Todi in Tuscany about 600, died in the Tauric Chersonese (Crimea), Sept. 16, 655. He was elected July 5, 649, and energetically opposed the spread of Monothelitism. He opened the first council of the Lateran, Oct. 5, 649, and had 20 decrees enacted condemnatory of the new heresy, as well as of a doctrinal edict called "Type," published by the reigning emperor Constans II., which forbade all controversy on the subject of one or two wills in Christ. He was consequently, by order of the emperor, held captive on the island of Naxos for 15 months (653-'4), and afterward carried to Constantinople, where he was publicly stripped of his clerical robes, led in chains through the city, and confined in a dungeon till March, 655, when he was sent to the Chersonese and left destitute of all means of subsistence. He is honored as a martyr in the Greek and Latin churches, and his feast is celebrated on Nov. 12. There are 18 encyclical letters of this pope in the *Bibliotheca Patrum* and Labbe's *Concilia*. **II. Martin IV. (Simo de Brion)**, born in Touraine about 1220, died in Perugia, March 28, 1285. By some he is designated as Martin II., but as the generality of writers consider the name Marinus identical with Martinus, the two popes bearing the former name are reckoned as Martin II. (Marinus I., died 884) and Martin III. (Marinus II., died 946). Simon was a regular canon and treasurer of the church of St. Martin at Tours. Louis IX. appointed him chancellor in 1260; in 1262 he was created by Urban IV. cardinal priest of Santa Cecilia; and under Gregory X. he was apostolic legate in France. He was unanimously elected pope at Viterbo, Feb. 22, 1281, after a long and stormy conclave. The two powerful rival families of Orsini and Annibaldi were bestowed on him the title of senator of Rome, which Martin transferred to Charles of Anjou, king of Naples and Sicily, by whose influence he had been elected, and whom he encouraged to aspire to the throne of Constantinople. The

Greek emperor, Michael Palæologus, who had been unable or unwilling to effect a reunion of the eastern with the western church, was excommunicated. Palæologus joined the party of Pedro III. of Aragon, who also, having come with a fleet and army to take possession of Sicily, was excommunicated, and was deprived of the crown of Aragon, which was given by the pope to Charles of Valois, son of the king of France. A crusade was then preached against Pedro in France and Italy. All these measures turned out disastrously for the pope's policy, while his own persecution of the Italian Ghibellines caused wide dissatisfaction and revolts. During a popular rising in Orvieto in 1285, the violence of the governor obliged Martin to take refuge in Perugia, where he died. He was canonized by the people of Perugia, but not by the universal church. **III. Martin V. (ORTONE COLONNA)**, born in Rome about 1365, died there, Feb. 20, 1431. He graduated in arts at the university of Perugia, and was sent by Boniface IX. as nuncio to the Italian courts. Innocent VII. created him cardinal and vicar of Rome. Under John XXIII. he was governor of the States of the Church. He was elected pope during the 41st session of the council of Constance (Nov. 11, 1417), and the next day published a bull on the Roman chancery, confirming the rules established by his predecessors, and apparently confirming the abuses complained of. A plan of reformation was submitted by the nations represented in the council. The pope presented a counter plan for debate, and meanwhile negotiated a separate concordat with each of the Transalpine powers. This broke up the council, which was solemnly closed on April 22, 1418. On Feb. 22 he published a bull condemning the Hussite doctrines, and proclaiming, at the prayer of King John I. of Portugal, a crusade against the Moors. On April 12 he issued a constitution forbidding all appeals from the pope to a general council, except in times of open schism. He departed from Constance May 16, and on his arrival in Milan he published a bull forbidding disturbance of Jews under any pretext, so long as they were guilty of no open offence against faith or morality. He remained at Florence from February, 1419, till Sept. 15, 1420, entered Rome Sept. 22, and devoted himself to the restoration of industry and commerce and the pacification of Italy. In January, 1431, he sent Cardinal Cesarini to preside at the opening of the council of Basel; but he was himself stricken with apoplexy before the day appointed for that purpose. He was a great patron of learning; his own palace and those of his cardinals were free schools of science and art for the youth of Italy.

MARTIN, Aimé. See AIMÉ-MARTIN.

MARTIN, Alexander, an American soldier, born in New Jersey about 1740, died in Danbury, N. C., in November, 1807. He graduated at the college of New Jersey in 1756, and removed in 1772 to Guilford co., N. C., became

a member of the colonial assembly, and in 1776 was appointed colonel of a regiment of the continental line, with which he fought at Brandywine and Germantown. He was state senator from 1779 to 1782, and in 1785, 1787, and 1788, and was speaker of the senate, and as such acting governor, in 1781-'2. In 1782 he was elected governor, and again in 1789, having in the interval been a member of the convention which framed the federal constitution; and from 1793 to 1799 he was United States senator from North Carolina.

MARTIN. I. Arthur, a French archæologist, born at Auray, Morbihan, in 1801, died in Ravenna in March, 1856. He became a Jesuit, and devoted himself exclusively to archæology. Besides several other remarkable illustrated works, he published with Père Cahier *Vitraux peints de Saint Etienne de Bourges* (imp. fol., Paris, 1842-'44), and *Mélanges d'archéologie* (4 vols. 4to, Paris, 1848-'56). In 1856, in a competition of European architects, he was chosen to design and construct the proposed cathedral at Lille; and having gone to Ravenna to make some preliminary studies, he died there of pneumonia. **II. Félix**, a French ecclesiastic, brother of the preceding, born at Auray, Oct. 4, 1804. He became a Jesuit, and in 1842 went to Canada to revive the mission there. He founded St. Mary's college, Montreal, over which he presided for many years; his architectural ability was displayed not only in that institution, but also in two adjacent churches. He collected material relating to the history of Canada, and contributed largely to the recent publications on that subject. He was next stationed at Quebec, but his eyesight becoming impaired, he returned to France, and has since been connected with a house of his order near Paris. His chief works are: *Manuel du pèlerin de Notre Dame de Bon Secours* (Montreal, 1848); *Relation des Jésuites*, an enlarged translation of O'Callaghan's bibliography of that series (1850); a French translation with notes of Bressani's *Breve relazione* (Montreal, 1852); *Mission du Canada, relations inédites* (Paris, 1861); *De Montcalm en Canada* (1867); and *Le R. P. Isaac Jogues* (1873). He explored the Huron country and prepared a report upon it, and has assisted Carayon in his series of volumes on the Jesuit missions.

MARTIN, Bon Louis Henri, a French historian, born in St. Quentin, Feb. 20, 1810. He was educated at the college of St. Quentin. *Wolfthurm*, a romance, written in conjunction with Félix Davin, appeared in 1830, and was followed by a series of historical novels illustrating the period of the Fronde. In 1833 he began the publication of *Histoire de France par les principaux historiens*, a work intended to embrace extracts, chronologically arranged, from the principal chroniclers and historians. One by one the contributors dropped off, until Martin was left to conduct the publication alone. Tiring of this occupation, he determined to substitute an original history, of

which the first edition, under the title of *Histoire de France*, appeared in 1833-'6 (15 vols. 8vo). Scarcely was the last volume issued from the press when he commenced a revision of the whole work on a more comprehensive plan, which occupied him 17 years, during which a second edition of the original work was also published. Of the 19 volumes of the second work, which appeared at irregular intervals, the 10th and 11th, devoted to "Religious Wars," received the first Gobert prize of the academy of inscriptions, and the 14th, 15th, and 16th, relating to the reign of Louis XIV., the second Gobert prize from the French academy, and after the death of Augustin Thierry, the first. After the completion of the second revision Martin published a third and more elaborate one, embracing the most recent discoveries in Celtic antiquities, and in ancient and mediæval history, religion, language, and literature (17 vols., 1855-'60), a portion of which was translated into English by Mary L. Booth ("History of France: Age of Louis XIV.," 2 vols., Boston, 1865). In 1867 Martin issued an illustrated edition (4to) of his history. In 1869 the institute awarded it the biennial prize of 20,000 francs. He has also published *Daniel Manin* (Paris, 1859), *L'Unité italienne et la France* (1861), *Jean Reynaud* (1863), *Pologne et Moscovie* (1863), *Vercingetorix*, a historical drama (1865), and *La Russie d'Europe* (1866). In 1848 M. Martin occupied the chair of modern history at the Sorbonne.

MARTIN, David, a French clergyman, born in Revel, Sept. 7, 1639, died in Utrecht, Holland, Sept. 9, 1721. He was admitted to the ministry in 1663, emigrated to Holland after the revocation of the edict of Nantes, and about 1686 became pastor and professor of theology and philosophy in Utrecht. He was an eminent Biblical scholar, and published *Histoire du Vieux et du Nouveau Testament* (Amsterdam, 1700), which has been often reprinted, was translated into Dutch, was embellished with 420 fine engravings, and is known as "Mortier's Bible;" editions of the Bible with notes, and a treatise on revealed religion.

MARTIN, François Xavier, an American jurist, born in Marseilles, France, March 17, 1764, died in New Orleans, Dec. 11, 1846. At the age of 18 he emigrated to Martinique, where he was unsuccessful in business. In 1786 he took up his residence in New Berne, N. C., and taught French. He also learned printing and established a newspaper, which he peddled through the adjoining counties; and subsequently he published school books, almanacs, translations of French works, &c. He was admitted to the bar, but continued to work as a printer, and published brief treatises on the duties of sheriffs, justices of the peace, executors, and administrators. He compiled the British statutes in force in North Carolina at the period of the revolution, with a digest of the statutes of the state, and a translation of "Pothier on Obligations," which, published in

1802, was rendered directly from the French into English type in the composing stick. He collected materials for a history of North Carolina, which was published chiefly in the form of annals (2 vols. 8vo, New Orleans, 1829). He also prepared a series of reports of the decisions of the higher courts of the state, now the oldest volumes of that character received as authority in the courts of North Carolina. After 20 years' practice in North Carolina he was appointed one of the judges of the territory of Mississippi, which post he filled for a year, when he was transferred to the bench of the territory of Orleans. Here he acquired the title of father of the jurisprudence of Louisiana, by his incessant and well directed labors in reconciling the discordant elements of law introduced by preceding jurisdictions. In February, 1813, soon after the formation of the state of Louisiana, he was appointed its attorney general; and in January, 1815, he was advanced to the bench of the supreme court, of which he remained a justice 32 years. He was partially and for ten years almost entirely blind, but discharged his duties regularly. He published reports of the superior court of Orleans from 1809 to 1813 (2 vols.), and of the supreme court of Louisiana from 1813 to 1830 (18 vols.), besides a digest of the territorial and state laws in French and English (2 vols.), prepared under a resolution of the legislature. He also published a history of Louisiana, from its settlement to the treaty of Ghent in 1814 (2 vols., 1827). He received the degree of LL. D. from Harvard college and Nashville university.

MARTIN, John, an English painter, born at Haydon Bridge, Northumberland, July 19, 1789, died in Douglas, Isle of Man, Feb. 9, 1854. He was apprenticed to a coach maker to learn heraldic painting, and subsequently to an Italian artist named Musso, whom he accompanied in 1806 to London. He supported himself for several years by painting on china and glass, and teaching. In 1812 he produced, after a month's labor, "Sadak in Search of the Waters of Oblivion," which was exhibited in the royal academy and sold for 50 guineas. It was followed by the "Expulsion from Paradise" (1813), "Clitë" (1814), and "Joshua commanding the Sun to stand still" (1815). The last received the prize of the year at the British institution. In the following years he produced the "Fall of Babylon" (1819), "Macbeth" (1820), "Belshazzar's Feast" (1821), which obtained the premium of £200 from the British institution, "The Destruction of Herculaneum" (1822), "The Seventh Plague" (1823), "The Creation" (1824), "The Deluge" (1826), and "The Fall of Nineveh" (1828). Mezzotint engravings of these works, executed by the artist and disseminated by many thousands, added to their reputation, and have still a considerable degree of popularity. Martin subsequently for several years devoted himself to designing and engraving a

set of illustrations for Milton, for which he received 2,000 guineas, and to projects for improving the city of London. About 1838 he resumed his pencil, and worked industriously until a few weeks before his death. His last productions, three large pictures, intended to be his masterpieces, and entitled "The Last Judgment," "The Day of Wrath," and "The Plains of Heaven," were, though left unfinished, exhibited in the United States in 1856.

MARTIN, Louis Aimé. See AIMÉ-MARTIN.

MARTIN, Luther, an American lawyer, born in New Brunswick, N. J., in 1744, died in New York, July 10, 1826. He graduated at the college of New Jersey in 1762, and till 1770 taught school at Queenstown, Md. In 1771 he was admitted to the bar in Accomac county, Va., and soon afterward removed to Baltimore. In 1774 he was a member of the convention at Annapolis to oppose the claims of Great Britain, and he published an "Address to the Inhabitants of the Peninsula between the Delaware River and the Chesapeake," urging resistance to British usurpation. In 1778 he was appointed attorney general of Maryland; in 1784-'5 was a delegate to the continental congress; and in 1787 a member of the convention which framed the federal constitution, the adoption of which he opposed, mainly on the ground that it did not sufficiently recognize the equality of the states by giving to each the same number of representatives. On his return he delivered before the Maryland assembly an elaborate address, afterward published under the title, "Genuine Information delivered to the Legislature of the State of Maryland relative to the Proceedings of the General Convention lately held in Philadelphia" (Philadelphia, 1788). In 1805 he defended Samuel Chase, an associate justice of the United States supreme court, who was impeached by the house of representatives for malfeasance, and was fully acquitted. In 1807 he was engaged with John Wickham, William Wirt, and John Randolph in the successful defence of Aaron Burr. In 1813 he was appointed chief judge of the court of oyer and terminer for Baltimore, and in 1818 he again became attorney general of Maryland and district attorney of Baltimore. In 1820 he was struck with paralysis, and two years afterward, with broken health and ruined fortune, he removed to New York to find refuge with Aaron Burr. He was a violent politician, and published essays against Jefferson and his party.

MARTIN, Saint, bishop of Tours, born at Sabaria in Pannonia about 316, died at Cande in Touraine about 400. He was educated for the military profession, and entered the army of Constantine the Great at 15. At 18 he was sent into Gaul and stationed at Amiens. He left the army in 338, and became the disciple of St. Hilary of Poitiers, who instructed him and ordained him priest. After living as a monk at Milan and in the little island of Gallinaria near Genoa, he rejoined St. Hilary at Poitiers

on his return from exile in 360. He built at Ligugé near that city the first monastery, according to some, established in Gaul. In 371 he was elected bishop of Tours, and built the monastery of Marmoutier, in which he chiefly resided, and which became so renowned for learning and piety that the neighboring churches chose their bishops there. The unwearied labors of Martin and his followers caused him to be looked upon as the second apostle of Gaul. He visited the imperial court repeatedly to denounce the tyranny of the provincial officers. In 383 he obtained from the usurper Maximus at Treves the pardon of several bishops and high magistrates sentenced to exile or death as adherents of the emperor Gratian. At the same time both he and St. Ambrose opposed Ithacius and other Spanish bishops, who urged Maximus to put to death the Manichæan Priscillian and his adherents. The Spaniards having succeeded in their purpose after Martin's departure, he renounced all fellowship with them. About 385 the historian Sulpitius Severus became his disciple, and thenceforward accompanied him in his continual missionary excursions. St. Martin is the first in the Latin church to whom was given the title of "confessor" as distinguished from that of martyr. His feast is celebrated on Nov. 11, hence called "Martinmas" in Great Britain, and distinguished by an equivalent appellation in France and Germany. His life, written by Sulpitius Severus, was printed in the second volume of Aldus Manutius's *Poeta Christiani* (Venice, 1501), and reprinted separately at Paris in 1511. See also Dupuy, *Histoire de Saint Martin* (Paris, 1852); and Montalembert, *Les moines d'Occident*.

MARTIN, Theodore, a British author, born in Edinburgh in 1816. He practised law for several years in Edinburgh, and in 1846 removed to London, where he became a parliamentary solicitor. He contributed to various periodicals under the signature of "Bon Gaultier," and published "The Book of Ballads, by Bon Gaultier," a series of burlesque pieces and parodies, written in conjunction with Professor W. E. Aytoun, with whom he was associated in a translation of the "Poems and Ballads of Goethe" (1858). He has translated the *Correggio* and *Aladdin* of Oehlenschläger; "King René's Daughter," a lyrical drama by the Danish poet Henrik Hertz; "The Odes of Horace," in English verse (1860); "The Poems of Catullus," in English verse, with an introduction and notes (1861); Dante's *Vita nuova* (1862); and Goethe's *Faust* (3d ed., 1870). He has also written a biography of W. E. Aytoun (Edinburgh, 1868), and "The Life of the Prince Consort," under the queen's supervision (London, 1875).

MARTINEAU, I. Harriet, an English authoress, born in Norwich, June 12, 1802. She is descended from French ancestors, who on the revocation of the edict of Nantes established themselves at Norwich. She received a liberal

education, and at an early age, being afflicted with a constantly increasing deafness and a total lack of the sense of smell, found her chief recreation in literary composition. Pecuniary disasters soon compelled her to rely upon her pen for support. In 1823 she published "Devotional Exercises for the Use of the Young," and in 1824 a tale entitled "Christmas Day," a sequel to which, "The Friend," appeared in 1825. Encouraged by the success of these works, she produced "Principle and Practice," "The Rioters," and "Original Hymns (1826); "The Turn-Out" and "Mary Campbell" (1827); "My Servant Rachel," a "Sequel to Principle and Practice" (1828); and a series of "Tracts" on questions relating to the working classes, in whose welfare several of her previous writings had shown a strong interest. In 1831 she published, under the title of "Traditions of Palestine," a series of sketches of the Holy Land during the period of Christ's ministry. In the same year she obtained prizes from the British and foreign Unitarian society for three tracts on "The Faith as Unfolded by many Prophets," "Providence as Manifested through Israel," and "The Essential Faith of the Christian Church." About this time she conceived the plan of issuing a series of monthly stories illustrating the leading principles of political economy. The society for the diffusion of useful knowledge, to which she at first applied, refused to enter into the project, and it was only after many rebuffs and disappointments that she succeeded in finding a publisher. The immediate and remarkable success with which the first tale was received repaid the authoress for her perseverance. The series extended to 24 stories, which were many times reprinted and translated into French and German, and which fixed her reputation as an earnest thinker and a writer of fiction. The "Illustrations of Taxation" and "Poor Laws and Paupers," which next appeared, were written with the same plan, and also published serially. In 1834-6 she travelled extensively in the United States, and on her return recorded her impressions of American life and institutions in a work entitled "Society in America" (1837). She also published in 1838 her "Retrospect of Western Travel," which gave more of her personal experiences. In the following year appeared "Deerbrook," her first and most popular novel; in 1840, "The Hour and the Man," a work of fiction founded on the career of Toussaint l'Ouverture; and about the same time a series of tales for children entitled "The Playfellow," among which were "The Settlers at Home," "Feats on the Fiord," and "The Crofton Boys." Her health, which had been delicate from childhood, became so seriously affected in 1839 that she was long obliged to desist from all literary occupation. In 1843 she published "Life in the Sick Room." On recovering through the agency, as she believed, of animal magnetism, she published in 1844 an account of the treatment in a letter which

excited much attention. Her next works were "Forest and Game Law Tales" (1845), and "The Billow and the Rock" (1846). In 1846, in company with her friends Mr. and Mrs. Richard V. Yates, she undertook an oriental tour, of which an account appeared in her "Eastern Life, Past and Present" (1848). Her next important publication was a continuation of the "History of England during the Thirty Years' Peace, 1816-1846," begun by Mr. Charles Knight, but of which only the first book had appeared (2 vols. 4to, 1849-'50; "Introduction," 1 vol., 1851). In the same year she published her correspondence with Mr. H. G. Atkinson on "The Laws of Man's Nature and Development," which abounds in curious revelations of her own psychological experiences, and manifests a decided leaning toward the principles of Comte. Her philosophical views were still more plainly set forth in a condensed version of Comte's "Positive Philosophy" (1854; 2d ed., 2 vols., 1871-'2). Among Miss Martineau's other writings are: "Five Years of Youth;" "How to Observe," a work for travellers, published in "Knight's Series;" "The Maid-of-all-work;" "The Housemaid;" "The Lady's Maid;" "The Dressmaker;" "Household Education;" a "Complete Guide to the Lakes" (1854); "The Factory Controversy" (1855); "Local Dues on Shipping" (1857); "British Rule in India" (1857); "England and her Soldiers" (1859); "Endowed Schools for Ireland" (1859); "Health, Husbandry, and Handicraft" (1861); "Steps in the Dark" (1864); and "Biographical Sketches" (1869). She has been a frequent contributor to periodicals and to the editorial columns of the London "Daily News," and has twice, on conscientious grounds, refused a government pension. **II. James**, an English Unitarian clergyman, brother of the preceding, born in Norwich about 1805. He studied at the Unitarian college in York, and was settled successively over chapels in Dublin and Liverpool. In 1853 he was called to the chair of moral and mental philosophy in Manchester New college. In 1857 he went with the college to London, and in 1869 became its principal, but retired in 1874. In 1859 he became joint pastor with the Rev. John James Tayler of the principal Unitarian chapel in Little Portland street, of which he was sole minister from 1861 to 1874. He was engaged in a controversy with 13 clergymen of the church of England, in a series of lectures afterward collected and published in two volumes, entitled "Unitarianism Confuted" and "Unitarianism Defended." He is the author of "The Rationale of Religious Inquiry" (1836); "Endeavors after the Christian Life" (2 vols., 1843; 5th ed., 1873); "Miscellanies," edited by the Rev. Thomas Starr King (Boston, 1852); "Studies of Christianity," edited by the Rev. William R. Alger (Boston, 1858); "Essays, Philosophical and Theological" (2 vols., 1866-'9); "Studies of Christianity" (1873); and many articles in the

"Westminster," "National," and other English reviews and journals.

MARTINET, Achille Louis, a French engraver, born in Paris in 1806. He studied under eminent artists, and in 1826 won the second, and in 1830 the first grand prize of Rome, where he spent five years. In 1835 he exhibited in Paris his engraving of Rembrandt's famous portrait of himself. He was so felicitous in his subsequent engravings from the works of the great Italian masters, that almost all prominent contemporary painters engaged him to engrave their pictures. One of his finest pieces is the engraving of Ary Scheffer's portrait of M. Viardot. Among his latest works are engravings of "The Nativity," by Murillo (1869); "The Virgin with the Pink," by Raphael (1872); and "The Martyrdom of St. Juliette and her Sons," by Heim (1873).

MARTINEZ DE LA ROSA, Francisco, a Spanish statesman, born in Granada, March 10, 1789, died Feb. 7, 1862. He became professor of moral philosophy at Granada when only 19 years old. He took an active part in the Spanish war of independence, was sent to ask arms and munitions of war from the governor of Gibraltar, and went on a similar mission to England, where he studied the institutions of constitutional government. He was imprisoned on account of his liberal opinions from 1814 till 1820, when the revolution set him at liberty, and he was for a time at the head of the cabinet. After the subversion of the constitution by French interference (1823), he spent several years in Paris, engaged in literary pursuits. He was made prime minister by Maria Christina in 1834, and promulgated the *estatuto real*, or new constitution; but the revolt of the Basque provinces led him to resign. During Espartero's regency he was ambassador in Paris and Rome, subsequently a member of Narvaez's cabinet, and from 1847 to 1851 again ambassador in Paris. After his return to Madrid he was twice chosen president of the senate, and in 1858 appointed president of the council of state. He was the author of many dramas, of which the best known is *La conjuración de Venecia*; *Isabel de Solís*, a novel; a collection of *Poesías*; and a review of the French revolution, entitled *Espíritu del siglo* (10 vols., 1835-'51).

MARTINI, Giambattista, an Italian composer, born in Bologna, April 25, 1706, died there, Aug. 4, 1784. He entered the order of Franciscans, visited Asia, and on his return was appointed chapelmaster to a Franciscan convent in Bologna. He was an industrious composer of church music, and published two musical treatises, an "Essay on Counterpoint" and a "History of Music" (3 vols. 4to, 1757-'81).

MARTINIQUE, or **Martinico**, one of the West India islands belonging to France, in the Windward group, lying between lat. 14° 23' and 14° 53' N., and lon. 60° 50' and 61° 19' W., 30 m. S. E. of Dominica and 20 m. N. of St. Lucia; length 45 m., greatest breadth 15

m.; area, 381 sq. m.; pop. in 1868, 153,334, including 16,618 coolies and about 20,000 whites. The island is irregular in form, high, rocky, and volcanic, containing five or six extinct craters. It is subject to earthquakes, of which several have been disastrous. In the interior are three mountains, the highest of which, Mont Pelée, in the north, 4,438 ft. above the sea, after a long period of inaction, burst forth in a violent volcanic eruption in August, 1851. From these mountains several ranges of low volcanic hills extend to the sea, and between them lie broad, fertile valleys. The rivers are numerous, but all small; most of them in the rainy season become fierce torrents. The coasts are indented by many bays, which are difficult of access. The E. side of the island, called Cabes-Terre, is more broken and sterile than the W., called Basse-Terre. About one third of the surface is under cultivation, the principal productions being sugar, coffee, cotton, cassia, manioc, bananas, indigo, maize, cacao, and ginger. The climate is humid, and the average annual fall of rain is 84 inches. The year is divided into two seasons, one commencing about Oct. 15 and lasting nine months, and the other comprising the rest of the year. During the latter season the rains are abundant, and yellow fever and similar diseases prevail. The mean annual temperature of the plains is 81° F. The value of the agricultural produce in 1869 was 12,730,354 francs; the number of cattle is about 150,000. The manufactures possess considerable importance; there are several establishments for the preparation of indigo, about 100 for the various processes in the preparation of sugar, coffee, cocoa, and cotton, besides potteries, lime kilns, and steam mills. There is an active commerce, chiefly with France. The exports are sugar, coffee, cocoa, cassia, dye and cabinet woods, cotton, rum, &c. The value of exports in 1869 amounted to 32,115,400 francs, and that of imports to 30,864,177; and the aggregate value of the import and export trade of France with Martinique was 40,384,549 francs. The number of vessels entering the ports in that year was 803; cleared, 858.—There is a governor, a privy council of seven members, and a colonial council of 30 members elected for five years. The judiciary consists of a supreme court, and two assize and two inferior courts. The capital is Fort Royal or Fort de France, but St. Pierre is the largest town and the chief seat of commerce.—Martinique, called by the Indians Madiana, was discovered by Columbus in 1502. The French colonized it in 1635, and during the war of American independence made it a great naval station. The British seized it in 1762, 1781, 1794, and 1809, finally restoring it by the treaty of Paris in 1814. The slaves rebelled in 1822, 1833, and 1839; slavery was abolished in 1848. Since 1866 the colony has legislated for itself on duties and public works. A railway is in progress of construction (1875) from Fort Royal to St. Pierre.

MARTINSBURG, a town and the capital of Berkeley co., West Virginia, on the Baltimore and Ohio railroad, at the terminus of the Cumberland Valley line, 210 m. E. N. E. of Charleston, and 65 m. W. N. W. of Washington; pop. in 1870, 4,863, of whom 476 were colored; in 1874, about 6,000. It is lighted with gas, supplied with water at a cost of \$90,000, and has handsome agricultural fair grounds, a commodious court house, a town hall, and a market house. The Baltimore and Ohio railroad has here extensive shops, and employs about 600 persons. The principal manufactures are a foundry, a planing mill, three grist mills, and a large distillery. There are three banks, with an aggregate capital of \$200,000, six school houses, a female seminary, a daily and two weekly newspapers, and 11 churches.

MARTIUS, Karl Friedrich Philipp von, a German traveller, born in Erlangen in 1794, died in Munich, Dec. 13, 1868. He graduated as a physician at the university of his native town, and from 1817 to 1820 accompanied Spix in Brazil as botanist, and published *Reise nach Brasilien* (3 vols., Munich, 1824-'31). The herbarium which he brought back to Germany included more than 7,000 species. On his return he was ennobled, and appointed professor and director of the botanic garden at Munich, from which he retired in 1864, and became president of the botanical society of Ratisbon. The botanical results of his journey he embodied in *Nova Genera et Species Plantarum* (3 vols., 1824-'32) and in *Icones Plantarum Cryptogamicarum* (1828-'34). His chief labor, however, he devoted to the study and collection of palms, and his *Genera et Species Palmarum* (3 vols., 1823-'45) is a magnificent contribution to botanical literature. His *Flora Brasiliensis*, commenced in Stuttgart in 1829, was continued under his direction, with the coöperation of several eminent botanists (No. 54, 1871). His latest works, partly posthumous, include *Beiträge zur Ethnographie und Sprachenkunde Amerikas* (Leipsic, 1867).

MARTOS, Ivan Petrovitch, a Russian sculptor, born about 1755, died in St. Petersburg, April 17, 1835. He studied in Rome at the expense of the empress Maria Fedorovna, and became director of the academy of fine arts in St. Petersburg. Among his chief works are the colossal bronze statues of Minin and Pozharsky at Moscow, the monument to the emperor Alexander at Taganrog, and that of Potemkin at Kherson.

MARTYN, Henry, an English missionary, born in Truro in 1781, died in Tokat, Asia Minor, Oct. 16, 1812. He was educated at St. John's college, Cambridge, where he obtained a fellowship in 1802. In 1803 he entered the ministry, and in 1805 set sail for India under the auspices of the African and eastern missionary society. He resided at Bengal as chaplain, and travelled for several years in India and Persia, preaching and studying the native languages. He was chosen to superintend the translation

of the New Testament undertaken by direction of the missionary society into Hindostanee and Persian. He had also made some progress in an Arabic version when his failing health compelled him to suspend his labors. His life was written by the Rev. John Sargent (1819).

MARTYNIA, a genus of plants, named in honor of Prof. John Martyn, of Cambridge, Eng., and belonging to a suborder of the *Bignoniaceae*, which some botanists regard as entitled to rank as an order, the *sesameae*. They are low branching annuals, with thick stems, which, as well as the simple rounded leaves, are clammy pubescent, and the whole plant has a rather heavy unpleasant odor. The flowers are in racemes, large, bell-shaped, five-lobed, and somewhat two-lipped; fertile stamens two or four. The fruit is an oval pod terminated by a long, slender, incurved beak, fleshy at first, but toward maturity becoming woody, and when quite ripe the beak splits into two hooked rigid horns, liberating numerous black and wrinkled seeds. There are six or eight



Martynia.

species, natives of warm countries, except one indigenous to the United States and found as far north as southern Illinois. Some of the species are cultivated as ornamental plants, their large, showy, red and yellow flowers strongly resembling those of the gloxinias. *M. fragrans*, from Mexico, has violet-purple flowers, which give off a pleasant vanilla-like odor. The native species, *M. proboscidea*, is sometimes called the unicorn plant, and is cultivated in gardens for the sake of its young fruit; the flowers in this species are dull white or purplish and spotted with yellow and purple. The young pods, taken when still thoroughly succulent, are used for pickling, and are by many considered better than any other vegetable for the purpose. In the southern states the fruit is called martinoes.

MARTYR (Gr. *μάρτυρ*, a witness), a term applied to all who suffer for any noble cause, but in a more limited sense to those who suffer death in order to bear witness to their religious belief. Some early writers bestowed the name

of martyrs on all those who had suffered torture for the faith; more generally, however, it was reserved to such as died under the hand of the executioner, or while enduring imprisonment or exile, all other sufferers being designated as "confessors." It is impossible to fix even approximately the number of the early Christian martyrs. Gibbon endeavored to prove that it was insignificant, but this opinion is not shared by more unprejudiced writers. In most cities where persecution raged, notaries were appointed by the bishops to keep lists of the sufferers, and a record of their trial, sufferings, and death. Of these records many, perhaps most, were destroyed in the persecution of Diocletian, when the Christians were compelled to give up all the books belonging to the churches. Out of what remained of them, supplemented by the local traditions, were afterward compiled the martyrologies of the principal Greek and Latin churches. (See *ACTA SANCTORUM*.) These must not be confounded with church calendars, which merely indicate for each day of the year the name of the saint whose festival it is. The martyrologies moreover indicate the sort of punishment endured, the place and time of martyrdom, and the name of the presiding magistrate. The "Roman Martyrology" aims at combining a complete list of martyrs and saints, with their "acts," and the days of the month on which their feasts occur.—The memory of the martyrs was held in special honor. The shedding of blood, in the case of unbaptized sufferers, was considered to be equivalent to baptism. Their tombs were guarded with jealous care and decorated with garlands; chapels were built over them; their anniversaries, called *natalitia martyrum*, were celebrated with enthusiasm; and it became a rule, when the persecutions ceased, to have the body of some martyr or a portion of his remains beneath the altar of every church. The Roman catacombs contain the remains of large numbers of martyrs. Prudentius, after mentioning this fact in one of his hymns, asserts that single numerals on the slabs point out to the initiated the chambers in which a number of martyrs were buried together. This fact was verified by Boldetti (*Osservazioni sopra i cimiteri de' santi martiri*, Rome, 1720), who discovered 150 martyrs entombed in one chamber in the cemetery of Sant' Ernesio, and 500 in a second, that of San Callisto; while Visconti (*Sposizione di alcune antiche iscrizioni cristiane*, Rome, 1824) designates another chamber containing 118 bodies. From this great storehouse the Roman Catholic churches are chiefly supplied, the altar stone on which the mass is offered always containing a relic of some martyr.—For the process followed in the canonization of martyrs, see Benedict XIV., *De Servorum Dei Beatificatione, et Beatorum Canonizatione*, abridged in Faber's "Essay on Beatification and Canonization" (London, 1848). On the general subject of early Chris-

tian martyrs, see Ruinart, *Acta Primitiva et Sincera Martyrum* (fol., Paris, 1689); Neander's "Church History;" and Bingham's "Antiquities of the Christian Church."—By Protestants the term martyrs is also applied to those who have suffered death as "heretics" at the hands of Roman Catholics in the persecutions of the Albigenses, the Waldenses, and the reformers in England, France, Spain, Germany, and the Netherlands. In Scotland those who suffered death as Covenanters or Cameronians during the persecutions in the reigns of the last Stuart kings are also considered as martyrs. Fox's "Book of Martyrs," which first appeared in London in 1563, and is still a popular work, details with much minuteness the persecutions of the Protestant reformers by the Roman Catholics in England and Scotland, "from the year of our Lorde a thousande unto the tyme now present." It gives especial prominence to the persecutions in the reign of "bloody Queen Mary," when Crammer, Latimer, Ridley, and several hundred other Protestants were burned at the stake for their faith.

MARTYR, Peter. I. An Italian historian and geographer. See ANGHIERA. II. A Protestant reformer. See VERMIGLI.

MARTYROLOGY. See ACTA SANCTORUM, BOLLAND, and MARTYR.

MARVELL, Andrew, an English author, born at Kingston-upon-Hull, Nov. 15, 1620, died in London, Aug. 16, 1678. He was the son of the Rev. Andrew Marvell, master of the grammar school and lecturer of Trinity church in Hull, and at the age of 15 was sent to Trinity college, Cambridge. He is said to have taken his degree of B. A. in 1638, and subsequent to 1641 he passed four years on the continent, remaining a considerable time in Italy, where he probably contracted his intimacy with Milton, which was interrupted only by the death of the latter. Subsequently he was a private tutor, and in 1657 was associated with Milton in the Latin secretaryship. About 1660 he was returned to parliament from Hull, a post which he filled by successive elections until the close of his life. He is said to have been the last member of parliament who received "wages" from his constituents. Between 1661 and 1663 he was in Holland, and from July in the latter year to 1665 he acted as secretary to Lord Carlisle, the ambassador extraordinary to Russia, Sweden, and Denmark. He maintained a close correspondence with his constituents, sending them during the greater part of his legislative career a daily account of the proceedings in parliament. These letters, first published in 1777, are written in a laconic, business-like style, and afford a curious illustration of the ability and fidelity with which Marvell performed his public duties. He never spoke in parliament, but his strong views of the corrupt practices of the time, his biting satires in prose and verse on influential placemen, and the conviction that he was not to be silenced by bribes or flattery, made him

a formidable enemy to the court. It is even said that he was threatened with assassination. His probity and honor earned for him the name of the "British Aristides." He died suddenly, supposed by some to have been poisoned, for which there seems to be no reasonable ground, and was buried in the church of St. Giles-in-the-fields at the expense of his constituents, who also voted a monument to his memory, which the rector refused to have erected. His chief work in prose is the "Rehearsal Transposed," a satirical reply to an acrimonious attack by Dr. Samuel Parker, afterward bishop of Oxford, upon the nonconformists. In the second part of the "Rehearsal," one of the most remarkable passages is the author's defence of Milton. His last work, "An Account of the Growth of Popery and Arbitrary Government in England" (1678), was so distasteful to the court, that a reward was offered for the discovery of the printer, and Marvell was compelled frequently to conceal himself. His poems comprise political satires, written in a coarser strain than his prose works, and some minor pieces of great tenderness and beauty, including the well known commendatory lines on Milton's "Paradise Lost." A full edition of his works was published in 1776 (3 vols. 4to); and there is an American edition of his poems, edited by James Russell Lowell (Boston, 1857; reprinted, London, 1870). The first volume of a complete edition of his works, with notes and a memorial, by A. B. Grossart, to comprise four volumes, appeared in London in 1872.

MARVEL OF PERU, a garden name for plants of the genus *mirabilis*, also called four o'clock. The genus belongs to the family *nyctaginaceæ*, and includes about half a dozen species, natives of the warmer parts of America. Though they are tuberous-rooted perennials, they bloom early from the seed, and are usually treated as annuals; the roots may be kept through the winter in the cellar and planted out in spring, when they will flower much earlier than plants from seed. The stems are jointed, and tumid at the joints at which are borne the opposite, simple, more or less heart-shaped leaves; the flowers are one or more from a large cup-shaped involucre, without petals, but the funnel-shaped calyx is petal-like and forms the showy portion of the flower; the stamens are five, and with the single style are protruded; in maturing, the lower portion of the calyx hardens to form a false pericarp around the fruit proper, while the upper portion falls away; this wonderful manner of forming what appears to be the fruit is said to have suggested the name *mirabilis* for the genus. The common four o'clock of the gardens is *M. Jalapa*, so called because at one time it was supposed to be the plant which furnished the medicine jalap; the tube of the flower is about 2 in. long; the colors are white, yellow, and various shades of red, often pleasingly variegated in the same flower, in blotches and stripes; in some flowers one

portion is pure white and the other red, the line of demarcation being perfectly distinct; in this species there is but one flower to each involucre, which in this case exactly represents a calyx. This plant was introduced into cultivation in 1596, and still retains its popularity;



Marvel of Peru (*Mirabilis jalapa*).

the flowers open toward sunset, or earlier in cloudy weather, a fact recognized in the name four o'clock; it is also known as afternoon lady, and the French call it *belle de nuit*. The long-flowered marvel of Peru (*M. longiflora*) has white sweet-scented flowers, the tube of which is 6 in. long, hairy and sticky. This species and the preceding have been hybridized, and varieties partaking of the peculiarities of both produced; the hybrids frequently produce fertile seeds. *M. Wrightiana*, from Texas, is in cultivation; the flowers are white, tinted with rose. As generally seen in gardens, the plants of marvel of Peru are crowded too much; in order to exhibit their beauty, they should be cultivated as isolated specimens.

MARWAR. See JOODPOOR.

MARX, Adolph Bernhard, a German composer, born in Halle, Nov. 27, 1799, died May 17, 1866. He held a judicial office at Nuremberg, but subsequently devoted himself exclusively to the study of music. In 1823 he became editor of the *Berliner allgemeine musikalische Zeitung*, and in 1830 was appointed professor of music in the university of Berlin. His principal works are: *Die Lehre von der musikalischen Composition* (Leipsic, 1834-'45; 6th ed., 1863 et seq.; English translation by Saroni, New York, 1852); *Allgemeine Musiklehre* (1839; 7th ed., 1863); and *Die Musik des 19. Jahrhunderts und ihre Pflege* (1855). He wrote treatises on the "Art of Singing" (1826), "Painting in Music" (1828), &c., besides many articles in Schilling's *Lexikon der Tonkunst*. He is known as a composer by several musical dramas, symphonies, &c., and by his oratorio "St. John the Baptist." He also published

Ludwig von Beethoven: Leben und Schaffen (Berlin, 1858; 2d ed., 1863); *Gluck und die Oper* (1862); and *Denkwürdigkeiten aus meinem Leben* (2 vols., 1865).

MARX, Karl, a German socialist, born in Treves in 1818. He completed his studies in Bonn and Berlin, and became in 1842 chief editor of the *Rheinische Zeitung* in Cologne. That journal being suppressed in 1843, he associated himself in Paris with Arnold Ruge in a critical revision of Hegel's "Philosophy of Jurisprudence," and with Friedrich Engels in the publication of *Die heilige Familie*, directed against Bruno Bauer and kindred writers. At the same time he attacked Prussia in the press, and at the request of that power he was expelled from France in 1846 and went to Brussels, where he and Engels published in 1848 a manifesto embodying the views of an international congress of workmen held at London in the preceding year; and he was then also expelled from Belgium. The revolution of 1848 enabled him to return to Paris and to Cologne, where he speedily founded the *Neue Rheinische Zeitung*, a revolutionary journal advocating the refusal of taxes as long as liberty was not established. His continued agitation involved him in perpetual conflicts with the authorities, and in 1849 he was expelled on account of his connection with the insurgents in the grand duchy of Baden. He once more went to Paris, and after the insurrection of June 18 to London, where he has since lived. He issued here in 1850-'51 a monthly edition of the *Rheinische Zeitung*, printed at Hamburg. In 1864 he was admitted as member of the newly established *Internationale*, and drew up the manifesto and statutes of this association, which were adopted in 1866 at the congress of Geneva, and henceforth he was officially recognized as the master spirit of that organization. (See INTERNATIONAL ASSOCIATION.) His principal works are: *Misère de la philosophie: Réponse à la Philosophie de la misère de Proudhon* (Brussels, 1847); *Zur Kritik der politischen Oekonomie* (Berlin, 1859); *Das Kapital: Kritik der politischen Oekonomie* (1859); and *Herr Vogt* (London, 1860), in which he accused Karl Vogt and his adherents of having sold themselves to Napoleon III.

MARY (Gr. *Μαρία* and *Μαριάμ*), the mother of Jesus. But little is recorded of her history in the Scriptures. Some authorities consider Luke's genealogy to be that of Mary, and Heli (Luke iii. 23) to have been her father. Epiphanius says that her parents were Joachim and Anna. Joachim or Jehoiakim and Eliakim are interchangeable (2 Chron. xxxvi. 4), and Eli or Heli is the abbreviation of the latter. The Latin as well as the eastern churches hold her father to be St. Joachim, whose feast is celebrated on the Sunday next following Aug. 15. The next mention of her is as a young maiden at Nazareth, where she was betrothed to a carpenter named Joseph. A heavenly messenger announced to her that through the over-

shadowing of the Holy Spirit she should conceive a son, who should be called the Son of God, and who would be the Messiah expected by the Jews. Almost immediately on receiving this announcement Mary hastened from Nazareth to visit her cousin Elizabeth, who was residing in the hilly district in "a city of Judah." While there, she uttered the *Magnificat*, a hymn which the Christian church has delighted from the earliest times to use as an expression of thanksgiving. After a sojourn of three months, she returned to Nazareth, when Joseph suspected her of infidelity, and resolved, in order to avoid a public exposure, to dismiss her privately. But an angel (Matt. i. 18-25) informed him in a dream of the true state of the case, and enjoined him to take Mary as his wife. He complied with this order, and was therefore regarded by the Jews as the father of Jesus. Soon after, when Augustus ordered a census to be taken throughout the empire, Mary went with Joseph to be enrolled at Bethlehem, the city of David, and there gave birth to Jesus. According to the law of Moses, she offered him in the temple (Luke ii. 22 *et seq.*), and returned with Joseph and the child to Nazareth, whence the whole family had to flee to Egypt. After the death of Herod they again took up their residence at Nazareth. When Jesus was 12 years old, Mary visited Jerusalem with him and Joseph at the time of the passover. On their return Jesus was missed from the company, and she discovered him sitting in the temple disputing with the doctors of the law. She was present at the marriage feast in Cana, where she drew her son's attention to the failure of the wine. After this event she appears to have lived alternately with her kinsfolk at Nazareth and Capernaum. She is thought to have come to Jesus to remonstrate with him on his wasting labors (Matt. xii.), while he was surrounded by a great crowd. The Gospel is then silent about her till she appears standing beneath the cross, and is consigned by Jesus to the care of the beloved disciple John. Thenceforward John's house is her home. The last mention made of her in the New Testament is in Acts i. 14, where it is stated that after the ascension she remained in the upper chamber, persevering in prayer with the holy women and the disciples and apostles. Some ancient writers, like St. Epiphanius, have thought it probable that she passed the rest of her life with John at Jerusalem. Another tradition says that she lived and died in the upper chamber, the scene of the last supper, now supposed to be the site of the mosque of the tomb of David. According to others, she accompanied John to Ephesus, and died there in extreme old age. In the 5th century opinion in the East was divided respecting her burial place, Ephesus and Gethsemane both claiming to possess her tomb.—Some legendary particulars relating to her early life, derived from the apocryphal gospels, have come down from century

to century. Such is the story of her betrothal to Joseph, with all its miraculous circumstances, as painted by Perugino, and afterward by his pupil Raphael. A tradition relating to the place and manner of her death says that she was buried at the foot of the mount of Olives. Some of the apostles, it is said, having come to Jerusalem the third day after her death, found it empty and exhaling a sweet fragrance. This incident is also the subject of one of Raphael's pictures.—Mary is the object of a special veneration in the Roman Catholic church, which honors the saints with the worship known as *dulia*, a religious service rendered them on account of the supernatural gifts wherewith it holds that God has distinguished them, but decrees to the Virgin the ampler honors of *hyperdulia*, placing her high above all created objects of religious respect on account of her singular prerogative as mother of God, and of the virtues with which she adorned this dignity. The early fathers of the church, Justin Martyr, Tertullian, Irenæus, and others, call her the second Eve. From the office thus assigned to her some Roman Catholic theologians deduce the immaculateness of her conception. Pope Pius IX., on Dec. 8, 1854, declared it to be a revealed doctrine that Mary was preserved from the stain of original sin by the merits of her Son. Controversies in reference to the proper position of Mary arose early in the history of the church. Those of the innovators who denied the divinity of Christ, as the Arians, denied her of course the title of mother of God, and so did they who denied the humanity of the Word, as the Eutychians; while the Nestorians, asserting a double personality in Christ, allowed her only the maternity of the human hypostasis. Further disputes occurred about the perpetual virginity of Mary. The church insisted upon the belief that Christ was born of a virgin mother, in accordance with the Apostles' Creed, reaffirmed by the Nicene and Athanasian symbols; and the council of Ephesus decreed expressly that Mary was the mother of God (*Θεοτόκος*), and condemned all who denied her that title. The Cerinthians taught first that Christ was born of Joseph and Mary, and their doctrines were repeated by Helvidius in Palestine and Bonosus in Illyria, their later followers adding that several children were born to Joseph and Mary after the birth of Jesus. Questions existed, until silenced by authority, between Catholic schools of theology, as the Thomists and Scotists, and between certain religious orders, as the Franciscans (who followed Duns Scotus) and the Dominicans (who upheld St. Thomas), in reference to Mary's conception, which the former held to have been utterly immaculate of all sin, and the latter maintained not to have been immaculate, or not at least from the earliest instant of her existence. (See IMMACULATE CONCEPTION.)—Many festivals are celebrated in the Roman Catholic church in honor of Mary. Her conception is commemorated by the feast

of the Immaculate Conception (Dec. 8); her birth by the Nativity (Sept. 8); the message of the angel by the Annunciation (March 25); her visit to Elizabeth by the Visitation (July 2); her visit to the temple by the Purification (Feb. 2); and her ascent to heaven by the Assumption (Aug. 15). The Nativity and Assumption are celebrated by both Greek and Latin churches. In the 11th century it became the custom in some places to honor her by special devotions on Saturdays, and later to devote the month of May to similar practices of piety. These devotions are nowhere a matter of obligation. An *Officium Beatæ Mariæ Virginis* was added to the breviary, and declared by Pope Urban II. (1095) to be obligatory on the clergy of the whole church. Several religious orders called themselves after Mary. To her intercession so great importance is attributed that the *Ave Maria* (Hail Mary) is generally used in connection with the Lord's prayer. Many other devotional exercises in her honor, especially the beads or rosary (see BEAD), are in common use; and the wearing of the scapular, which she is believed to have given to the general of a religious order, Simon Stock, with the promise of special favors to all who wear it in her honor, was encouraged by several popes, who attached to it many indulgences. The house in which Mary dwelt at Nazareth is believed in Italy to have been transported by angels to Loreto. The miraculous cures ascribed to the intercession of Mary are innumerable; a collection of some belonging to recent times may be found in the "Annals" of the "Archconfraternity of the Immaculate Heart of Mary," an association which was established in Paris in 1830. Many towns in every Catholic country possess celebrated images of Mary, which attract crowds of pilgrims during the year or on stated festivals.—See Canisius, *De Mariæ Virgine* (Ingolstadt, 1577); Home, "Mariolatry" (London, 1841); Tyler, "Worship of the Blessed Virgin Mary" (London, 1844); Mrs. Jameson, "Legends of the Madonna" (London, 1852); Genthe, *Die Jungfrau Maria* (Halle, 1852); T. S. Preston, "Ark of the Covenant" (New York, 1860); Cardinal Wiseman, "Lectures on the Church" (Baltimore, 1862), and "Sermons" (New York, 1874); Pusey, "Eirenicon" (London, 1866); and Newman's reply to the "Eirenicon" in "Difficulties felt by Anglicans" (London, 1874).

MARY I., first queen regnant of England and Ireland, fourth sovereign of the Tudor line, and daughter of Henry VIII. and of Catharine of Aragon, born at Greenwich palace, Feb. 18, 1516, died at St. James's palace, Nov. 17, 1558. She was severely educated, according to a code of instructions drawn up by Ludovicus Vives. She was the object of various matrimonial negotiations in her infancy; it was proposed by treaty in 1518 that she should marry the dauphin, son of Francis I. of France, and in 1522 she was betrothed to the emperor Charles V. He desired that she should be

sent to Spain for education, but her parents would not consent to part with her, though they gave her a Spanish education. A Scottish match was proposed in 1524. Her father was at that time passionately attached to her, declaring her heir to the crown, and, according to one authority, creating her princess of Wales. She had a magnificent court at Ludlow castle, her chamberlain being that Dudley, duke of Northumberland, who in after days sought to prevent her from ascending the throne, and whom she sent to the scaffold. The countess of Salisbury, the last of the Plantagenet family, was at the head of her establishment. The emperor broke his contract with her on the ground that her father, by seeking a divorce from her mother, was seeking also his daughter's degradation. Henry then sought to marry her to Francis I., but that prince took for his second wife the emperor's sister Eleanor. Catharine wished her daughter to marry a son of Lady Salisbury, whose brother, Warwick, had been murdered by Henry VII. on the demand of Ferdinand of Aragon, before he would consent that his daughter should marry a prince of the house of Tudor. This son was the famous Reginald Pole, afterward cardinal. Her hand was asked for the duke of Orleans, second son of Francis I., but vainly. After the birth of Elizabeth, Mary was degraded from the position she held; and when James V. of Scotland asked her in marriage, his suit was refused, from the fear that issue from such union would interfere with the title of Anne Boleyn's children to the crown. As she resisted as far as she could, it was reported that her father was indignant, and that her life was in danger. The treatment she received justified the fears that were entertained, and the emperor interfered in her behalf. After Anne Boleyn's death (1536) Mary was better treated; but her father's object, which was a renunciation of her right to the succession, was not obtained until some time after this change, when she signed articles acknowledging that her mother's marriage was incestuous and illegal, her own birth illegitimate, and the king's supremacy over the church absolute. She was then restored to some favor. Her hand was again asked for the duke of Orleans, and she stood sponsor to the young prince who was afterward Edward VI. Negotiations for her marriage with various princes were fruitlessly made, among them being the prince of Portugal, the duke of Cleves, and the duke of Bavaria. As she was regarded as the head of the Catholic party, she was an object of suspicion to her father and to the Protestants, and her situation was made painful by the legal murder of most of her friends, including the countess of Salisbury; but in 1544 she was restored to her place in the line of succession by act of parliament. She lived on the best terms with her last stepmother, Catharine Parr, and at her instance translated Erasmus's Latin paraphrase of St. John. During the reign of Edward

VI. she took no part in politics, though she was denied the free enjoyment of her religion. Suitors for her hand continued to present themselves: the duke of Brunswick, the margrave of Brandenburg, and the infante of Portugal. The emperor threatened war if she were not exempted from the penalties prepared for nonconformists, and she was suspected of intending to take refuge at his court. On the death of Edward VI. (July 6, 1553) Mary succeeded him, after a brief but unimportant struggle with the partisans of the Dudleys and Greys, who had set up Lady Jane Grey as queen. She was merciful to the fallen, only three persons being executed for treason; and she refused to bring the lady Jane to trial, saying that she was merely a tool of Northumberland. A reaction in the government took place, for which the queen was less blamable than her councillors, the principal of whom was Bishop Gardiner, who was made lord chancellor Aug. 23, 1553. Mary interfered to prevent the perpetration of cruelty by the privy council, and the early part of her reign was mild. Her coronation took place Oct. 1, 1553. Her first parliament met four days later, and restored the laws relating to life and property to the state they were in at the 25th of Edward III., and annulled all the acts that cast a stain on the queen's legitimacy. The religious laws of Edward VI. were repealed, and the church of his father was restored, making Mary its head, much against her will; but while she held the post, the Protestants were not persecuted. Lady Jane Grey was attainted, but it was known that the queen intended to spare her life. Mary's resolution to marry Philip of Spain caused great alarm to her subjects. Formidable insurrections broke out, which were not quelled without much exertion, and in the course of the brief rebellion the queen showed both courage and capacity. The effect of this struggle was to give entire ascendancy to the reactionary party in the royal councils. The death warrants of Lady Jane Grey and her husband, and of other persons, were signed; and the queen was urged to put to death her sister Elizabeth and the earl of Devonshire, who, however, were only sent to the tower. When her ministers would have punished the rebels with that sweeping slaughter which characterized most of the Tudor reigns, she interfered, and saved their lives. The marriage of Mary and Philip took place July 25, 1554. It proved fatal to Mary's peace, and most injurious to her character and reputation. On Nov. 30 Cardinal Pole declared England and Rome reconciled, and those persecutions which have made of Mary's reign a by-word and a reproach were commenced with the burning of John Rogers, Feb. 4, 1555. According to many historians, they were due to the influence of Gardiner and Bonner, the queen being ill most of the time. Ranke gives credit to Gardiner's assertion that the queen herself, and not he, insisted on the revival of the old laws against the

Lollards; and though he admits that many of the horrors of their execution may have been kept from her, he adds that no apology will free her memory from the dark stain that clings to it: "for whatever is done in the name of a prince, with his will and by his authority, decides his reputation in history." Mary was neglected by her husband, to whom she was warmly attached. For his sake she declared war with France, June 7, 1557, and English forces took part in the battles of St. Quentin and Gravelines. In January, 1558, the French captured Calais, which the English had held for more than two centuries. War with France brought on war with Scotland. The loss of Calais was so mortifying to the English, that they insisted that Philip should make no peace with France without providing for its restoration. Mary's health had never been good, and she was indisposed during the greater part of her reign, of which circumstance her council took advantage. She suffered from dropsy and nervous debility, and her disappointment from not having children aggravated her illness. She recognized Elizabeth as her successor. In the summer of 1558 she was attacked by intermittent fever, of which thousands of her subjects had died, the consequence of the wet seasons that prevailed throughout her reign. When it was evident that her last hour was at hand, her court was deserted, most of its members hastening to Hatfield, the residence of Elizabeth. She was buried on Dec. 13, in Henry VII.'s chapel.

MARY II., first queen regnant of Great Britain and Ireland, daughter of James II. and wife of William III., born at St. James's, April 30, 1662, died at Kensington palace, Dec. 28, 1694. Her father at the time of her birth was heir presumptive to the throne and duke of York, and her mother was Anne Hyde, daughter of the earl of Clarendon. She was educated at Richmond palace, with her sister Anne, her preceptor being Henry Compton, bishop of London, and was a very well informed woman for those times. She was married to her cousin, William, prince of Orange, Nov. 4, 1677, an alliance which was very popular throughout Great Britain. Mary's father, as heir presumptive to the British crown, was an object of jealousy to all Protestants except the high churchmen, and even they saw with pleasure that his heir, the princess of Orange, was strongly attached to the church of England. William was jealous of his wife's position, as should she succeed to the throne, she would be his superior in rank and power; and should she die before him, and childless, the throne would pass to her sister Anne. William stood next in the order of succession to Anne, and all hope of Charles II. having legitimate offspring had long been abandoned. The prince was not a faithful husband, but the personal difficulties between him and his wife were removed before those of a political character were known to her. Burnet, afterward bishop

of Salisbury, effected a complete reconciliation between the prince and princess, the latter pledging herself to surrender all power to her husband, should circumstances ever place her on the British throne. When William found himself compelled to take the leadership of that comprehensive opposition party which was formed in England against James II., in 1687-'8, he was strenuously supported by Mary against her father. The latter had never since her marriage treated her well, had used some of her friends harshly and illegally, and had conspired to take from her the crown of Ireland; and she shared in the common belief that the prince of Wales, born in 1688, was a supposititious child, who had been introduced into the royal family to prevent her from ever enjoying her inheritance. She acquiesced in the plan for the invasion of England in 1688; and when the earl of Danby sought to obtain the throne for her on the ground that there had been a demise of the crown, and that she was the next heir, she wrote him an earnest reprimand, declaring that she was the prince's wife, that she had no other wish than to be his subject, that the most cruel injury that could be done to her would be to set her up as his competitor, and that she never could regard any person who took such a course as her true friend. Could William have had his way, he would have reigned alone, and Mary would have been only queen consort; but the opposition to this plan was so great that it was never pressed. The convention parliament declared William and Mary king and queen of England. Mary arrived in England on Feb. 12, 1689, and on the 13th she and her husband accepted the crown. William had requested her to assume a cheerful air, in order to set aside the report that she thought she was wronged; and she so far overdid her part that her levity gave general offence and occasioned many lampoons. The coronation took place April 11, 1689, when Mary was inaugurated like a king. During the absence of her husband, when in Ireland or on the continent, Mary was placed at the head of the government, and in that position showed tact and firmness under very trying circumstances. In 1692, after the naval victory of La Hogue, she declared that Greenwich palace, then in course of construction, should be converted into a retreat for those seamen who should be disabled in their country's service; and the vow thus made was kept. Toward the end of 1694 she was attacked by smallpox, of which she soon died, to the great grief of her husband, to whom her decease was a political as well as personal loss, as her participation in his government gave to it a certain show of hereditary right. The attacks of the Jacobites on her unfilial conduct continued even after her death. She was buried with great pomp in Henry VII.'s chapel in Westminster abbey.

MARYLAND, one of the original states of the American Union, situated between lat. 37° 53' and 39° 44' N., and lon. 75° 4' and 79° 33'

W., having an extreme length E. and W. of 196 m., and a breadth varying from less than 10 m. in the W. part to about 120 m.; area (not including Chesapeake bay, which comprises 2,835 sq. m.), 11,124 sq. m. It is bounded N. by Pennsylvania, on a parallel known as "Mason and Dixon's line," E. by Delaware and the Atlantic ocean, and W. by West Virginia. The remaining boundary is irregular. E. of Chesapeake bay it is bounded S. by Virginia, on a line E. from the mouth of the Pocomoke river to the Atlantic; W. of that bay it borders S. W. on Virginia and the District of Columbia, and S. on West Virginia, the boundary line (except where interrupted by the District of Columbia) following the Potomac river to the head of its North branch.



State Seal of Maryland.

The state is divided into 23 counties, viz.: Allegany, Anne Arundel, Baltimore, Calvert, Caroline, Carroll, Cecil, Charles, Dorchester, Frederick, Garrett, Harford, Howard, Kent, Montgomery, Prince George's, Queen Anne, St. Mary's, Somerset, Talbot, Washington, Wicomico, and Worcester. There are five cities, viz.: Baltimore (pop. in 1870, 267,354), the chief commercial and manufacturing mart; Frederick (8,526); Cumberland (8,056), the depot of the mining region in the W. part of the state; Hagerstown (5,779); and Annapolis (5,744), the capital. Cambridge, Chesapeake City, Chestertown, Easton, Elkton, Ellicott City, Havre de Grace, Laurel, Newtown, Port Deposit, St. Michael's, Salisbury, Sharpsburg, Westminster, and Williamsport are towns having each more than 1,000 inhabitants.—The population of Maryland in 1660, according to McSherry ("History of Maryland," Baltimore, 1849), was 12,000; in 1665, 15,000; in 1671, 20,000; in 1701, 25,000; in 1715, 30,000; in 1748, 130,000 (36,000 slaves); in 1756, 154,188 (46,225 slaves); in 1761, 164,007 (49,675 blacks, mostly slaves); in 1775, 200,000; in 1782, 254,050, of whom 83,362 were slaves. According to the federal census returns, it has been as follows:

CENSUS YEARS.	White persons.	Free colored.	Slaves.	Total population.
1790.....	208,649	8,048	108,086	819,728
1800.....	246,326	19,557	105,635	841,543
1810.....	255,117	38,927	111,502	880,546
1820.....	260,223	89,730	107,397	907,350
1830.....	291,108	52,988	102,994	447,040
1840.....	818,204	62,078	89,787	470,019
1850.....	417,948	74,728	90,863	588,034
1860.....	515,918	88,942	87,189	687,049
1870.....	605,497	175,891	.....	780,894

Included in the last total are 2 Chinese and 4 Indians. In 1870 Maryland ranked 20th among the states in total population, a gain since 1860 of 13·66 per cent.; 18th in white population, gain 17·36 per cent.; 11th in colored population, gain 2·49 per cent. Of the total population, 697,482 were native and 83,412 foreign born. Of the natives, 629,882 were born in the state, 22,846 in Pennsylvania, 20,237 in Virginia and West Virginia, 6,876 in Delaware, 3,890 in New York, 1,853 in New Jersey, 1,212 in Massachusetts, and 1,163 in Ohio. There were 175,666 persons born in the state living in other states and territories. Of the foreigners, 47,045 were born in Germany, 23,630 in Ireland, 4,855 in England, and 2,432 in Scotland. There were 384,984 males and 395,910 females. Of the colored inhabitants, 151,463 were blacks and 23,928 mulattoes. The number of male citizens of the United States 21 years old and over was 169,845. The number of families was 140,078, having an average of 5·57 persons to a family; of dwellings, 129,620, with 6·02 persons to a dwelling. There were 114,100 persons 10 years old and over who could not read; 135,499 could not write, of whom 126,907 were natives and 8,592 foreigners, 46,796 whites and 88,703 colored, 61,981 males and 73,518 females; 21,572 were from 10 to 15 years of age, 21,452 from 15 to 21, and 92,471 were 21 and over. Of the last number, 13,344 were white males and 27,123 colored males. There were 427 blind persons, 384 deaf and dumb, 733 insane, and 362 idiotic; number of paupers supported during the year ending June 1, 1870, 1,857, at a cost of \$163,584; receiving support June 1, 1,612, of whom 265 were foreigners and 566 colored; number of persons convicted of crime during the year, 868; number in prison June 1, 1,035, of whom 68 were foreigners and 668 colored. The number of persons 10 years old and over returned as engaged in occupations was 258,543 (213,691 males and 44,852 females), of whom 80,449 were employed in agriculture, 79,226 in professional and personal services, 35,542 in trade and transportation, and 63,326 in manufactures and mining. Included in these numbers were 48,079 agricultural laborers, 31,213 farmers and planters, 938 clergymen, 34,742 domestic servants, 28,571 laborers, 772 lawyers, 1,771 officials and employees of government, 1,257 physicians and surgeons, 2,190 teachers, 9,775 traders and dealers, 9,840 in other mercantile pursuits, 2,859 officials and employees

of railroad companies, 3,529 carmen, draymen, teamsters, &c., 5,968 sailors, steamboatmen, watermen, &c., 3,231 blacksmiths, 4,793 boot and shoe makers, 2,806 masons and stonecutters, 1,128 brick and tile makers, 1,566 butchers, 1,235 cabinetmakers and upholsterers, 7,904 carpenters and joiners, 1,086 cigar makers and tobacco workers, 1,483 coopers, 1,992 cotton and woollen mill operatives, 1,569 fishermen and oystermen, 1,709 iron and steel workers, 1,027 machinists, 1,116 millers, 2,041 milliners and dressmakers, 2,838 miners, 1,845 painters and varnishers, 5,868 tailors, tailoresses, and seamstresses, 1,256 tanners, and 1,026 wheelwrights.—The surface of the eastern shore of Maryland, which forms a part of the peninsula lying between Chesapeake and Delaware bays, is low and level except in the N. part, where it is somewhat broken and rocky. The soil of this region is generally sandy. That part of the western division of the state which forms the peninsula between Chesapeake bay and the estuary of the Potomac presents the same natural features. The northwest is rugged and mountainous. The Blue Ridge, and other main ranges of the Alleghanies, cross it from Virginia and West Virginia into Pennsylvania. None of these chains attains a great elevation.—The seacoast has a length of only 33 m.; but including the whole tide-water region of Chesapeake bay, the shore line is estimated at 411 m., and if the shores of islands be included, at 509 m. The principal rivers belonging wholly or in part to Maryland are the Potomac, Patuxent, Severn, Patapsco, Susquehanna, Elk, Choptank, Nanticoke, and Pocomoke. The rivers of the eastern shore, with the exception of the Choptank and Nanticoke, are rather inlets into which flow numerous small creeks than rivers, and are navigable only near their mouths. On the western shore, however, are the Potomac, navigable about 125 m.; the Patuxent, 50 m.; the Patapsco, 22 m.; and the Susquehanna, navigable beyond the Maryland boundary. Above Washington the Potomac receives the Monocacy river, Antietam creek, the Coneocheague river, and many smaller streams. The extreme W. part of the state is drained by the Youghiogheny river, which through the Monongahela empties into the Ohio. Chesapeake bay, which almost bisects the state, extending northward within 14 m. of the frontier of Pennsylvania, receives nearly all the rivers of Maryland. At its mouth, between Cape Charles and Cape Henry, it is 15 m. wide, its opening facing east; but on penetrating the land it almost immediately changes its direction, its length lying almost due N. and S. A little below the mouth of the Potomac it is about 30 m. wide, after which it again contracts, and at its head branches off into several small estuaries, just above the mouth of the Susquehanna. It is nearly 200 m. long, and navigable throughout. It contains many small islands, and its shores are indented with innumerable bays and inlets. The

Atlantic coast of Maryland has no harbors, and is bordered throughout by a sandy beach from a few yards to more than a quarter of a mile in breadth, enclosing a shallow lagoon.—In the variety of its geological formations and mineral productions, Maryland is one of the most remarkable states in the Union. Along the seaboard and the shores of Chesapeake bay occur alluvial deposits of the present epoch. Next older are the beds of the pleistocene recognized in St. Mary's co., whence the formation extends southward along the coast of Virginia and North Carolina. The eastern shore is overspread almost exclusively with the clays, sands, and calcareous marls of the miocene; and the same formation is found on the W. side of the bay, reaching back to the E. edge of the metamorphic rocks, the line of which is commonly marked by the lowest falls of the rivers, as they descend from this platform of ancient rocks. The miocene formation is exposed in the banks of the creeks and rivers, and its beds of shell marl are there largely excavated for their valuable fertilizing materials. Deposits of bog ore are found in this formation, as well as in more recent ones. Among the tertiary ferruginous sands and clays spread over the western shore, from the vicinity of Washington to the head of the bay, are numerous deposits of argillaceous carbonate of iron in flat bands and balls. The cretaceous formation enters the N. E. corner of the state from New Jersey and Delaware; but it is lost S. of the Susquehanna river. Immediately back of Baltimore are hills of metamorphic rocks, talcose and mica slates, and limestones, which extend N. E. and S. W. across the state. Among them are serpentine rocks, which constitute barren hills known as the "Bare Hills." In these, beds of chrome iron have been extensively worked, and their products have been converted into chrome pigments, and also exported to Europe. The same formations have yielded large quantities of the silicates and hydrates of magnesia. Mines of copper ore have also been worked in the metamorphic rocks, and others of hematite support numerous blast furnaces; in the same group of rocks are also extensive quarries of limestone and marble. At Sykesville, on the Patapsco, specular iron ore is found, and worked in connection with pyritous copper ores. Passing westward across the metamorphic belt, and included in it, is a narrow strip of the "middle secondary red sandstone," which is traced from New Jersey through Pennsylvania and Maryland into Virginia. It passes through Carroll and the eastern part of Frederick co., crossing the Potomac just W. of Montgomery co. In this region was obtained from this formation the brecciated marble of which the pillars in the old hall of representatives in the capitol at Washington were made. In Frederick co., along the range of this belt, have been worked several copper mines. The portion of the metamorphic group lying W. of this trough

of the middle secondary is but a few miles wide; and in the Catoctin and South mountains, on the W. line of Frederick co., are found the Silurian rocks, the Potsdam sandstones, and the Trenton and associated limestones, the lower members of the Appalachian system of rocks. The calcareous strata overspread the E. portion of Washington co., extending N. in a broad belt into Pennsylvania and S. into Virginia. The finest valleys of the middle states lie on their range, and wherever met with these rocks give fertility to the soil and beauty to the scenery. Newer members of the Appalachian series of rocks succeed toward the west these lower formations, and are repeated with them in successive parallel ridges, which are the eastern members of the Appalachian chain. At Cumberland in Allegany co. commences the ascent of the main ridges. Up their slope the middle Silurian rocks soon give place to the red shales and sandstones of the Devonian, and these are succeeded by the carboniferous formation, which caps the summits of Dan's and Savage mountains, and overspreads the intervening valley of George's creek, as the strata dip in each direction into the trough-shaped basin. At Frostburg, Lonaconing, Westernport, and other points in the valley, is obtained the semibituminous coal known in the eastern markets as Cumberland coal. Extensive works have been in operation at Mt. Savage, and also at Lonaconing, converting the iron ores of the coal formation into pig iron, and this into rails and other forms of wrought iron. The supply of ores, however, has proved uncertain, and, like most other attempts to found large operations upon these ores, the enterprises have not prospered. From this point to the W. boundary of the state the country continues mountainous, consisting of parallel ridges and valleys, the former capped by the coal formation or the underlying conglomerate and red and gray sandstones, and the valleys occupied by the coal measures. According to the census of 1870, the number of mining establishments in operation was 80, having 32 steam engines of 888 horse power, and 2 water wheels of 32 horse power; number of hands employed, 3,801 (1,241 above and 2,560 below ground); amount of capital invested, \$25,369,730; wages paid, \$1,839,952; value of materials used, \$205,547; of products, \$3,444,183. There were 22 mines of bituminous coal, yielding 1,819,824 tons, valued at \$2,409,208; 43 of iron ore, yielding 98,354 tons, valued at \$600,246; 2 of copper, producing \$71,500 worth of ore; 2 marble quarries, yielding \$275,000; 2 slate, and 9 stone quarries. Of the coal mines 20 were in Allegany co. Of the iron 50,487 tons were produced in Baltimore co., 18,300 in Carroll, 12,000 in Frederick, 9,300 in Allegany, and 6,190 in Anne Arundel.—The climate of the state is temperate, and in most places salubrious, although the lowlands bordering on the bay are subject to miasmata which

produce bilious fevers and fever and ague. The mean annual temperature in the middle portion of the state is 56°; in the north, 54°; and in the highest parts in the west, 50°. Rain is abundant, the largest annual fall (50 inches) occurring on the W. shore of Chesapeake bay. The mean temperature at Baltimore for each month of the year ending Sept. 30, 1873, was as follows: October, 58-3°; November, 43-6°; December, 32-2°; January, 34°; February, 35-5°; March, 40-3°; April, 51-9°; May, 62-3°; June, 73-9°; July, 79-4°; August, 76-3°; September, 68°; year, 54-64°. The minimum was 2° (in February); the maximum, 96-5° (in July). The total rainfall was: October, 4-08 inches; November, 8-17; December, 2-72; January, 4-27; February, 4-74; March, 3-02; April, 2-77; May, 6-31; June, 0-94; July, 2-90; August, 9-49; September, 3-70; year, 48-11. The number of deaths in 1870 was 9,740, of which 3,978 were from general diseases, 1,161 from diseases of the nervous, 339 of the circulatory, 1,342 of the respiratory, and 1,499 of the digestive system, and the rest from miscellaneous causes. Among deaths from special diseases were: consumption, 1,678; pneumonia, 742; cholera infantum, 604; enteric fever, 434; scarlet fever, 331; whooping cough, 281; croup, 272; encephalitis, 249; convulsions, 239; paralysis, 231; diphtheria, 218; dropsy, 186; measles, 177; dysentery, 167; diarrhœa, 157; teething, 143; and hydrocephalus, 112.—The soil of the eastern shore is not naturally rich, but by the aid of manure it may be made to yield abundant crops. On the other side of the bay a tract closely resembling this lies along the shore. It has been much improved by the use of marl, bone dust, and guano, and forms the chief tobacco-growing region of the state. Some of the valleys of the interior and northern counties are extremely fertile. The commonest forest trees are the oak, hickory, chestnut, pine, locust, walnut, cedar, gum, and beach. Tobacco, wheat, and Indian corn are the staple cultivated crops. In 1870 Maryland was fifth among the states in the production of tobacco. Oats, rye, Irish and sweet potatoes, hay, milk, butter, wool, &c., are also produced. Peaches, strawberries, &c., are extensively cultivated in the E. part of the state. The number of farms in 1870 was 27,000, of which 1,314 contained less than 10 acres each, 1,764 from 10 to 20, 4,825 from 20 to 50, 7,026 from 50 to 100, 11,894 from 100 to 500, 163 from 500 to 1,000, and 14 1,000 acres and over. The number of acres of improved farm land was 2,914,007; cash value of farms, \$170,369,684; of farming implements and machinery, \$5,268,676; amount of wages paid during the year, including value of board, \$8,560,367; estimated value of all farm productions, including betterments and additions to stock, \$35,343,927; value of orchard products, \$1,319,405; of produce of market gardens, \$1,039,782; of forest products, \$613,209; of home

manufactures, \$63,608; of animals slaughtered or sold for slaughter, \$4,621,418; of live stock, \$18,433,698. The productions were 1,095 bushels of spring and 5,773,408 of winter wheat, 307,089 of rye, 11,701,817 of Indian corn, 3,221,643 of oats, 11,315 of barley, 77,867 of buckwheat, 57,556 of peas and beans, 1,632,205 of Irish potatoes, 218,706 of sweet potatoes, 35,040 of clover seed, 2,609 of grass seed, 1,541 of flax seed, 15,785,339 lbs. of tobacco, 435,213 of wool, 5,014,729 of butter, 6,732 of cheese, 2,800 of hops, 30,760 of flax, 70,464 of maple sugar, 3,439 of wax, 118,928 of honey, 11,583 gallons of wine, 1,520,101 of milk sold, 28,563 of sorghum molasses, 374 of maple molasses, and 223,119 tons of hay. The live stock consisted of 89,696 horses, 9,830 mules and asses, 94,794 milch cows, 22,491 working oxen, 98,074 other cattle, 129,697 sheep, and 257,893 swine. There were also 12,520 horses and 16,040 cattle not on farms.—The number of manufacturing establishments was 5,812, having 531 steam engines of 13,961 horse power, and 937 water wheels of 18,461 horse power; number of hands employed, 44,860, of whom 34,061 were males above 16, 8,278 females above 15, and 2,521 youth; amount of capital invested, \$36,438,729; wages paid, \$12,682,817; value of materials used, \$46,897,032; of products, \$76,593,613. The following table exhibits the number of establishments, with the capital and value of products, of the principal branches:

INDUSTRIES.	No. of establishments.	Capital.	Value of products.
Agricultural implements.....	34	\$281,300	\$549,065
Bags, paper and other than paper.....	8	100,000	558,275
Boots and shoes.....	512	767,105	3,111,076
Bread and bakery products.....	150	874,195	1,220,369
Brick.....	73	1,063,800	1,191,545
Carriages and wagons.....	123	297,650	667,187
Clothing.....	223	2,234,525	5,970,718
Coal oil, rectified.....	8	198,000	647,389
Confectionery.....	52	249,585	738,431
Cooperage.....	88	290,454	573,752
Copper, milled and smelted....	1	800,000	1,016,500
Cotton goods.....	22	2,734,250	4,552,808
Fertilizers.....	15	438,800	632,852
Flouring and grist mill products	518	2,790,700	6,756,459
Fruits and vegetables, canned.	19	603,800	1,587,220
Furniture.....	181	845,845	1,888,068
Gas.....	5	1,820,000	1,027,165
Glass.....	4	145,700	246,400
Iron, forged, rolled, &c.....	13	1,015,500	3,654,212
“ pigs.....	14	2,006,000	2,148,069
“ cast.....	43	754,135	928,094
Leather, tanned.....	69	792,430	1,265,888
“ curried.....	50	288,145	623,308
“ morocco, tanned and curried.....	4	64,000	163,000
Lime.....	24	106,150	224,119
Liquors, distilled.....	8	220,700	850,261
“ malt.....	82	553,500	665,743
Lumber, planed.....	11	241,800	474,877
“ sawed.....	301	1,053,600	1,707,471
Machinery, not specified.....	22	372,700	581,311
“ steam engines and boilers.....	7	435,000	372,475
Molasses and sugar, refined....	4	908,000	7,007,537
Musical instruments and materials.....	9	594,000	674,600
Oil, vegetable.....	2	145,000	473,125
Oysters and fish, canned.....	13	553,300	1,418,200
Paints.....	5	440,000	1,027,500

INDUSTRIES.	No. of establishments.	Capital.	Value of products.
Paper.....	26	\$1,206,000	\$948,710
Pork, packed.....	1	125,000	595,000
Saddlery and harness.....	195	207,385	539,083
Sash, doors, and blinds.....	17	282,425	419,506
Ship building, repairing, and ship materials.....	81	172,500	857,404
Sap and candles.....	13	230,050	521,439
Tin, copper, and sheet-iron ware.....	183	668,500	1,634,009
Tobacco and cigars.....	234	910,000	1,772,257
Woollen goods.....	28	193,945	390,086

The value of manufactures in 1810 was \$8,-879,861; in 1840, \$13,509,636; in 1850, \$33,-043,892; in 1860, \$41,735,157. — Maryland ranks sixth among the states in the value of foreign commerce, which is carried on wholly through Baltimore. The imports for the year ending June 30, 1874, amounted to \$29,302,-138; domestic exports, \$27,613,111; foreign exports, \$179,593. The chief items of export

were 76,053,533 lbs. of leaf tobacco, valued at \$5,868,405; 6,809,609 bushels of Indian corn, \$5,287,444; 412,743 barrels of flour, \$3,240,-967; 38,665 bales of cotton, \$2,669,219; and 13,321,567 lbs. of lard, \$1,325,636. There were 1,117 entrances, tonnage 558,599, and 1,026 clearances, tonnage 524,847. The number of entrances in 1873 was 861, with an aggregate tonnage of 397,167, of which 367, of 118,637 tons, were American vessels, and 494, of 278,-530 tons, foreign; clearances, 853, with an aggregate tonnage of 411,161, of which 321, of 109,490 tons, were American, and 532, of 301,-671 tons, foreign. Besides Baltimore, Maryland includes the customs district of Annapolis, the eastern district, and part of the district of Cherrystone, Crisfield being the port of entry of the two last. The following table gives the details of the coastwise trade, with the vessels registered, enrolled, and licensed, for the year ending June 30, 1874, and those built during the previous year:

DISTRICTS.	ENTRANCES.		CLEARANCES.		REGISTERED, &C.		BUILT IN 1873.	
	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.
Annapolis.....	4	183	8	176	94	1,904	2	71
Baltimore.....	1,951	1,316,429	2,211	1,541,151	1,424	121,167	56	4,499
Eastern.....	18	1,480	3	404	475	19,177	46	1,588
Total.....	1,973	1,318,047	2,217	1,541,731	1,993	142,268	104	6,158

Of the vessels registered, &c., or belonging in the state, 1,296 with an aggregate tonnage of 67,616 were sailing vessels, 113 of 39,325 tons steamers, and 584 of 35,327 tons unriggered vessels. Those built include 77 sailing vessels of 3,665 tons, 6 steamers of 950 tons, and 21 canal boats of 1,543 tons. The oyster fisheries of Chesapeake bay are of great value, and are the

chief source of supply for the markets of the United States. The state maintains several police boats to enforce the regulations governing the fishery, and derives a revenue from licenses to those engaged in it.—The number of miles of railroad in operation in 1844 was 259; in 1854, 327; in 1864, 408. The statistics of the various lines for 1874 are as follows:

RAILROADS.	TERMINI.	Miles in operation in the state.
Annapolis and Elk Ridge.....	Annapolis to a junction with the Baltimore and Ohio railroad.....	20½
Baltimore and Potomac.....	Baltimore to Washington.....	40
Branch.....	Bowie to Pope's Creek.....	49
Baltimore and Ohio.....	Baltimore to Wheeling, W. Va. (379 m.).....	187½
Washington branch.....	Relay House to Washington.....	31
Metropolitan.....	Point of Rocks to Washington.....	42½
Branch.....	Frederick Junction to Frederick.....	8
Columbia and Port Deposit.....	Port Deposit to Rolandville Junction.....	5
Cumberland and Pennsylvania.....	Cumberland to Piedmont, W. Va.....	38
Branches.....	Cumberland to Astor Mines.....	14
	Kreighbaum's to Pennsylvania line.....	8
Cumberland Valley.....	Harrisburg, Pa., to Williamsport (82 m.).....	14
Dorchester and Delaware.....	Seaford, Del., on Delaware railroad to Cambridge (33 m.).....	27
Eastern Shore.....	Delmar on Delaware line, at terminus of Delaware road, to Crisfield.....	88
Frederick and Pennsylvania.....	Frederick to Woodsboro.....	17
Kent County.....	Townsend, Del., on Delaware road, to Parsons (36 m.).....	29
Maryland and Delaware.....	Clayton " " to Easton (44 m.).....	30
Northern Central.....	Baltimore to Sunbury, Pa. (138 m.).....	36
Philadelphia and Baltimore Central.....	West Chester Junction, Pa., to Rowlandville Junction (46 m.).....	9½
Philadelphia, Wilmington, and Baltimore Branch.....	Philadelphia to Baltimore (96 m.).....	54
Pittsburgh, Washington, and Baltimore Branch.....	Perryville to Port Deposit.....	3½
Queen Anne and Kent.....	Pittsburgh, Pa., to Cumberland (149½ m.).....	6
Washington County.....	Massey's Junction, on Kent County railroad, to Centerville.....	36
Western Maryland.....	Hagerstown Junction, on Baltimore and Ohio railroad, to Hagerstown.....	24
Wicomico and Pocomoke.....	Baltimore to Williamsport.....	90
Worcester.....	Salisbury, on Eastern Shore railroad, to Berlin.....	23
Worcester and Somerset.....	Berlin to Snow Hill.....	14
	Newtown Junction, on Eastern Shore railroad, to Newtown.....	9
Total.....		843½

The Frederick and Pennsylvania railroad is to be extended to the Pennsylvania line, making the entire length 28 m. The Washington County line is operated by the Baltimore and Ohio company, the Worcester by the Wicomico and Pocomoke, and the Columbia and Port Deposit by the Philadelphia and Baltimore Central. The Southern Maryland railroad is in progress from Washington to Point Look-out, at the entrance of the Potomac into Chesapeake bay, 75 m. The Chesapeake and Ohio canal follows the valley of the Potomac from Cumberland to Georgetown, D. C., 184½ m., thence crossing the Potomac by an aqueduct to Alexandria, Va. A portion of the Susquehanna and Tidewater canal, from Wrightsville, Pa., on the Susquehanna river, opposite Columbia, to Havre de Grace, 45 m., is within this state; and also a portion of the Chesapeake and Delaware ship canal, which connects the waters of Chesapeake and Delaware bays.

—The number of national banks in operation in the state in 1873 was 33, having an aggregate capital of \$13,640,203; state banks, 10, with \$2,913,013 capital; savings banks, 7, with deposits to the amount of about \$15,000,000. There were 17 fire and marine insurance companies chartered by the state, having an aggregate capital of \$2,651,568; assets, \$4,967,378; liabilities, \$1,048,797. There were 71 companies of other states and 10 foreign companies doing business in Maryland. There were 2 home life insurance companies, with \$200,000 capital, \$864,394 assets, and \$601,770 liabilities; and 38 companies of other states doing business in Maryland.—The constitution vests the executive power in a governor, who is assisted by a secretary of state, attorney general, comptroller, treasurer, state librarian, and commissioner of the land office. The governor and attorney general are elected by the people for a term of four years, and the comptroller for two years; the treasurer is chosen by joint ballot of the two houses of the legislature for two years; the other officers are appointed by the governor, with the advice and consent of the senate, for four years. The governor must be 30 years of age, for ten years a citizen of the state, and for the last five years a resident thereof. He grants reprieves and pardons except in cases of impeachment, remits fines and forfeitures for offences against the state, and has a veto upon the acts of the legislature, which may be overcome by a three-fifths vote of both houses. He enters upon his office on the first Monday of January after his election, and has a salary of \$4,500. In case of his death, resignation, or disqualification, the legislature elects a governor for the residue of the term. If that body is not in session, the president of the senate, or in default of that officer the speaker of the house of delegates, acts until a new governor is chosen. The governor, comptroller, and treasurer constitute the board of public works. The legislative power is vested in a general assembly, con-

sisting of a senate and house of delegates. The senators, 26 in number (one from each county and one from each of the three legislative districts of the city of Baltimore), are elected for four years, one half retiring biennially. The delegates (present number 85) are elected for two years, and are apportioned among the counties after each census according to population. Senators must have attained the age of 25 years. The legislature meets biennially on the first Wednesday in January of even years. Regular sessions are restricted to 90 days, but the governor may call special sessions, which shall not exceed 30 days. Members receive \$5 a day during the session, and the presiding officers \$8, besides mileage. The house possesses the power of impeachment; the senate constitutes the court for the trial, two thirds being necessary for a conviction. The court of appeals has appellate jurisdiction only, and consists of the chief judges of the first seven circuits, besides a judge specially elected by the electors of Baltimore city. The state is divided into eight judicial circuits, the city of Baltimore constituting the eighth. In each circuit, except the eighth, a chief judge and two associate judges are elected, and in each county a circuit court is held, having general original jurisdiction both civil and criminal, and appellate jurisdiction of judgments of justices of the peace. In the city of Baltimore there are five courts, viz.: the superior court of Baltimore city, the court of common pleas, and the Baltimore city court, having concurrent original jurisdiction in all civil common law cases (the city court having in addition exclusive jurisdiction of appeals from judgments of justices of the peace, and the common pleas exclusive jurisdiction in matters of insolvency); the circuit court of Baltimore city, with exclusive original jurisdiction in equity; and the criminal court of Baltimore, with general original jurisdiction of crimes. A chief judge and four associate judges constitute the supreme bench of Baltimore, designating one or more of their number to hold the above described courts, and any three or more to hold general terms with certain appellate powers. Judges are elected by the voters of the respective circuits for a term of 15 years, and cannot hold office beyond the age of 70. Three judges of the orphans' court are elected in each county and the city of Baltimore for a term of four years. Justices of the peace are appointed by the governor, with the advice and consent of the senate, for the term of two years, and have jurisdiction of most civil cases, not involving the title to land, in which the amount in dispute does not exceed \$100. Under the constitution every white male citizen of the United States, of sound mind and not a convict, 21 years of age and upward, who has resided for a year in the state and for six months in the county or legislative district, may vote in the ward or election district in which he resides. Under the provisions of the

15th amendment to the constitution of the United States, colored citizens are entitled to vote. No one who engages in or aids or abets a duel, or sends or accepts a challenge, nor any defaulter in public funds, can hold office; and no minister of the gospel or person holding any civil office of profit or trust under the state or United States, except that of justice of the peace, is eligible to the legislature. The legislature is prohibited from lending the credit of the state to any individual, association, or corporation, and restrictions are placed upon the power of special legislation, of contracting a public debt, and of pledging the faith or credit of the state for the construction of internal improvements. Amendments to the constitution must be proposed by three fifths of each house of the legislature and ratified by the people. Every 20 years the people are to vote on the question of holding a convention to revise the constitution. Murder in the first degree is punished with death; arson, rape, and treason, with death or imprisonment for a term of years, in the discretion of the court; other crimes are punished by fines and imprisonment. The chief grounds of divorce are adultery, abandonment for three years, impotency at the time of marriage, and illicit intercourse of the wife before marriage, unknown to the husband. A separation from bed and board may be had on the ground of cruel treatment, excessively vicious conduct, or desertion. A married woman may acquire, hold, and manage separate property free from liability for the debts of her husband; she may dispose of it by will as though single, but her husband must join with her in any deed. The rate of interest is 6 per cent. Maryland has two senators and is entitled to six representatives in congress, and has therefore eight votes in the electoral college.—The valuation of property, according to the United States census, has been as follows:

YEARS.	ASSESSED VALUE.			True value of real and personal estate.
	Real estate.	Personal estate.	Total.	
1850...	.....	.....	.....	\$219,217,864
1860...	\$65,841,438	\$281,798,800	\$297,135,238	876,919,944
1870...	256,910,332	186,924,556	423,834,918	643,745,976

The taxation not national in 1870 was \$6,632,842, of which \$1,781,252 was state, \$1,542,218 county, and \$3,309,372 town, city, &c. The total debt amounted to \$29,032,577, of which \$13,317,475 (bonded) was state, \$1,565,779 (\$1,305,395 bonded) county, and \$14,149,313 (\$14,097,856 bonded) town, city, &c. The amount given as state debt includes liabilities incurred in aid of railroads, canals, &c. The sinking fund amounted to \$1,764,450. According to the report of the comptroller for the year ending Sept. 30, 1873, the receipts into the state treasury, including a balance of \$339,171 10 on hand at the beginning of the year, were \$2,771,848 58, of which \$1,814,-

348 96 was from ordinary sources, viz.: \$268,955 61 from dividends and interest paid by banks and railroad and canal companies, \$715,664 81 from taxes on property, \$4,605 27 from taxes on state and other stocks, \$77,868 47 from taxes on incorporated institutions, \$540,263 53 from licenses on trades and occupations, marriages, the oyster fishery, &c., \$15,183 36 from fees, \$14,349 13 from fines and forfeitures, \$7,629 73 from grain inspections, \$16,403 97 from tobacco inspections and warehouses, \$8,777 34 from state live-stock scales, \$2,559 41 from state wharves, \$2,332 01 from the land office, \$65,195 52 from taxes on commissions of executors and administrators, \$39,817 61 from taxes on collateral inheritances, \$4,773 50 from taxes on protests, and the rest miscellaneous. The disbursements were \$2,287,038 36, leaving a balance at the close of the year of \$484,810 22; besides which there was \$14,220 08 in the treasury to the credit of the school fund, and \$66,579 28 to the credit of the sinking fund. Deducting \$453,296 02 paid in redemption of the debt, and \$152,500 to meet the state's subscription to stock of railroad companies in Charles and St. Mary's counties, the ordinary expenditures amounted to \$1,681,242 34, viz.: \$15,000 for the blind asylum, \$16,800 for bounty to volunteers, \$25,406 67 for salaries of civil officers, \$77,961 92 for colleges and academies, \$49,904 91 for colored schools, \$30,000 for the deaf and dumb asylum, \$10,000 for the colored deaf and dumb and blind asylum, \$50,050 for various charitable and reformatory institutions, \$701,909 29 for interest on the public debt, \$88,802 78 for salaries of judicial officers, \$2,500 for the Maryland inebriate asylum, \$14,000 for the state penitentiary, \$23,816 72 for the militia, \$49,200 for pensions, \$388,566 97 for public schools, \$9,500 for the state normal school, \$2,000 for the colored state normal school, and the rest miscellaneous. The assessed value of property was \$424,672,712, and the tax, 17 cents (10 cents for public schools) on \$100, amounted to \$721,994 17. The assets of the state on Sept. 30, 1873, were represented by productive stock and bonds of railroad and other companies to the amount of \$4,455,464 18; amount due from incorporated institutions, tax collectors and other officers, \$1,995,701 96; unproductive stock and bonds and accrued interest, \$21,608,694 51; total, \$28,059,860 65. More than \$20,000,000 of the unproductive assets consist of stock and bonds of and interest due from the Chesapeake and Ohio canal company, which it is believed, at a not very distant period, will make some return to the state. The funded debt at the above date amounted to \$10,741,215 60. Deducting the sinking fund and the productive stock and bonds, the net debt was \$6,219,172 14. The free school fund, including the fund for the indigent blind (\$10,770 47), amounted to \$314,010 16, invested in stocks and bonds, except \$14,220 08

cash in the treasury. The balance to the credit of the oyster fund was \$272,014 14; receipts during the year, \$65,490 55; expenditures, \$24,770 75; both included in the receipts and expenditures given above.—The state institutions are the penitentiary, the institution for the instruction of the blind, and that for the colored blind and deaf mutes, in Baltimore; the hospital for the insane, at Spring Grove, near Catonsville, Baltimore co.; and the institution for the education of the deaf and dumb, at Frederick. The penitentiary is under the management of a board of six directors, with six officers in immediate charge. The number of convicts in prison during the year ending Nov. 30, 1873, was 824, of whom 226 were received during the year; remaining at its close, 614, viz.: white males, 211; white females, 6; colored males, 361; colored females, 36. The convicts are employed in the prison, but the labor of the greater part is let to contractors, who manufacture shoes, harnesses, clothing, cooperage, marble work, &c. The earnings in 1873 amounted to \$71,104 50, producing a surplus of more than \$5,000 over the expenditures. The hospital for the insane was established in Baltimore in 1828. In 1852 the legislature provided for the erection of the present building, which remaining uncompleted and encumbered with a heavy debt in 1870, the old hospital was sold, and the proceeds, with an appropriation of \$330,000 from the state treasury, devoted to its completion. The patients were removed to it in 1872. It is capable of accommodating 300. The institution is under the management of a president and board of visitors, with four resident officers. The number of inmates during 1873 was 238; remaining at the close of the year, 127, of whom 70 were males and 57 females, 57 private and 70 public patients; 102 were chronic cases, 13 acute mania, 9 epileptic, and 3 *manica a potu*. Aside from such appropriations as the legislature may make, the income is derived from the receipts from the counties for pauper patients and from private patients. The institution for the instruction of the blind was opened in 1854. The number of pupils under instruction during the year ending Dec. 1, 1873, was 55; remaining at that date, 47, of whom 7 were from the District of Columbia and supported by the United States; number of officers and instructors, 10. Besides reading, &c., the boys receive instruction in piano tuning and broom making, and the girls in sewing, knitting, &c. The age of admission is between 9 and 18 years, and pupils may be educated at the expense of the state, upon the recommendation of the governor. The institution for the education of the deaf and dumb was established in 1868, and was accommodated in barracks until the completion of the centre and south wing of the new building in the beginning of 1873. The north wing is not yet erected (1874). The number of pupils under instruction in 1873 was 99 (62 males and 37 females); remaining at

the close of the year, 87; number of officers and instructors, 16; volumes in the library, 2,000. Instruction is given in articulation and lip reading, and in shoemaking, as well as in the common branches of learning by the ordinary methods. The age of admission is from 9 to 21 years, and pupils may be educated at the public expense upon the certificate of the orphans' court or commissioners of the county in which they reside. The institution for the colored blind and deaf mutes was established in 1872, and in 1874 had 5 officers and instructors and 23 pupils, of whom 10 were deaf mutes and 13 blind. The house of refuge for juvenile delinquents, near Baltimore, was opened in 1855. The boys receive instruction in the rudiments of learning and in various industries. A "house of merit" is connected with it, in which the younger and less vicious are separately classified. The institution is mainly supported by state and city appropriations. The number of inmates during 1873 was 411; remaining at the close of the year, 301. An act of 1874 provides for the establishment of a house of correction for convicts sentenced for not less than three months nor more than three years.—The constitution requires the general assembly to establish a system of free public schools, and to provide for its maintenance by taxation or otherwise. The act of 1872 constitutes a state board of education, a board of county school commissioners for each county, and a board of district school trustees for each school district, to have general control of the public schools in their respective jurisdictions. The state board consists of the principal of the state normal school *ex officio*, together with four persons appointed for two years by the governor, with the consent of the senate, from among the presidents and examiners of the county boards, one of whom must be a resident of the eastern shore. The county boards consist of three or five members, and are appointed for two years by the judges of the circuit courts. They elect a person, not of their number, to act as secretary, treasurer, and examiner, and an assistant examiner in the larger counties when necessary. The schools are free to all white youth between the ages of 6 and 21 years, and at least one is directed to be kept open in each district for ten months in the year. The teachers must be graduates of the normal school, or have a certificate of competency from the county examiner or the state board. Teachers' institutes are required to be held once a year for five days in each county, under the direction of the county examiner and the principal or a professor of the normal school. The act empowers the mayor and council of the city of Baltimore to establish a system of free public schools, and to appoint a board of commissioners of public schools for that city. Separate free schools are established in each election district for colored children between the ages of 6 and 20 years, for the support of which are set apart such sums

as may be appropriated by the state or given by individuals for that purpose, together with the taxes paid by the colored people for school purposes. According to the report of the state board for the year ending Sept. 30, 1873, the number of public schools in operation was 1,742, including 225 for colored children; number of different pupils, 130,324 (14,171 colored); highest number enrolled in one term, 99,258; average daily attendance, 60,817; number of teachers, 2,555; average length of schools, 9 months and 13 days; amount paid for teachers' salaries, \$889,476 47; for building, repairing, and furnishing school houses, \$197,387 10; for books and stationery, \$69,526 29; for colored schools, \$69,577 18; total expenditures for school purposes, \$1,354,066 71, defrayed partly by a state tax of 10 cents on \$100, partly by the income of the school fund, and partly by local taxation. The schools of the city of Baltimore included one college or male high school, two female high schools, and 40 grammar schools (one colored). A few high and grammar schools have been established in other parts of the state; but the public schools are mostly elementary. The Baltimore city college had 10 instructors; number of different pupils during the year, 470; average attendance, 282. The state normal school for the training of teachers was established in Baltimore by the school law of 1865, and its continued existence has been provided for by subsequent acts; 200 pupils are entitled to be admitted free on the recommendation of the county or city school commissioners, upon declaring their intention to engage in teaching in

the state, and others may be received upon the payment of tuition. The number of instructors in 1873 was 9; of pupils, 146, of whom 13 were males and 133 females; volumes in the library, 1,200. A model school is connected with it. The Howard normal school (colored), at Baltimore, was organized in 1865. It receives a small appropriation from the state, but is supported mainly by donations. The number of pupils in 1873 in all departments (primary, grammar, and normal) was 234; average attendance, 186. The number in the normal department was 74; volumes in the library, 1,000. The number of academies receiving state aid was 22, with 50 teachers and 1,257 pupils. According to the United States census of 1870, the number of schools of all kinds was 1,779, having 1,498 male and 1,789 female teachers, 55,800 male and 51,584 female pupils; income from endowment, \$21,697; from taxation and public funds, \$1,134,347; from other sources, including tuition, \$842,171; total, \$1,998,215. Of these, 1,487 (3 normal, 10 high, 49 grammar, 159 graded common, and 1,266 ungraded common) were public, with 2,150 teachers, 83,226 pupils, and an income of \$1,146,057, of which \$1,039,135 was derived from taxation and public funds. Of those not public, 53 were classical (19 colleges and 34 academies), 7 professional (1 law, 2 medical, 4 theological), 12 technical (1 agricultural, 3 commercial, 1 for the blind, 1 for the deaf and dumb, 6 of art and music), 153 day and boarding, and 67 parochial and charity. The statistics of the principal colleges for 1873-'4 are exhibited in the following table:

COLLEGES.	Location.	Denomination.	Date of organization.	No. of professors, &c.	Students.	Volumes in libraries.
Washington*	Chestertown	None	1782	2	31	1,000
St. John's	Annapolis	None	1784	11	130	4,000
Frederick*	Frederick	None	1797	3	100	3,000
Mount St. Mary's	Emmettsburg	Roman Catholic	1830	13	182	8,000
College of St. James	College of St. James P. O., Washington co.	Episcopal	1842	6	41	11,000
St. Charles's*	Ellicott City	Roman Catholic	1843	12	180	4,000
Loyola*	Baltimore	Roman Catholic	1852	15	140	21,500
Mount St. Clement's	Hechester	Roman Catholic	1853	14	160	9,000
Rock Hill	Ellicott City	Roman Catholic	1857	22	149	6,500
Maryland Agricultural*	Agricultural College P. O., Prince George's co.	None	1865	9	130	.....
Woodstock	Woodstock	Roman Catholic	1867	14	102	.....
Western Maryland	Westminster	Methodist Prot.	1868	13	181	3,500

These institutions, besides courses of collegiate grade, have preparatory departments, which embrace a large portion of the students. Mount St. Mary's college has a theological department, with 34 students not embraced in the number given in the table. St. Charles's college is regarded as a preparatory institution to the theological seminary of St. Sulpice and St. Mary's university at Baltimore (which in 1873-'4 had 6 professors and 60 students), and is designed only for those who are intended for the church. The Western Maryland college has a three years' course for females, with an at-

tendance of 61 students included in the number given in the table, and gives special instruction to young men intended for the ministry. The college of St. James since the civil war has had only a high school or preparatory department in operation. Woodstock college is devoted exclusively to the education of the younger members of the society of Jesus, and embraces a three years' course of philosophy and a four years' course of theology; 42 of the students in 1873-'4 were pursuing the former course and 60 the latter. Six state scholarships have been established in St. John's college for each senatorial district, exempting the holder from payment of room rent and tuition fees, and

* 1872-'3.

in 1872 the legislature provided for furnishing board to two of the incumbents from each district, who after receiving the advantages of the college for four years are required to teach school within the state for not less than two years. Several state scholarships have also been established in the Frederick, Washington, and Western Maryland colleges. The collegiate department of the agricultural college embraces a four years' course of arts, including agriculture and ordinary scientific and English studies, with classics and modern languages, and a three years' course of science, which is the same as the preceding, with the omission of classics. Provision is also made for such as desire to remain but one year in the institution. The college received the proceeds (\$110,000) of the 210,000 acres of land granted to the state by congress for the establishment of a college of agriculture and the mechanic arts. A farm of 300 acres is connected with it. Tuition is free; and in accordance with an act of the legislature 12 students from each congressional district receive the use of text books free. The medical department of Washington university was established in Baltimore in 1833; a hospital and free dispensary are connected with it; in 1874 it had 11 professors and 313 alumni; the number of students in 1872-'3 was 192. The medical department of the university of Maryland in Baltimore was established in 1807; in 1873-'4 it had 12 professors, 114 students, and a library of 3,500 volumes. The Maryland college of pharmacy in Baltimore was established in 1841, and in 1873-'4 had 4 professors and 54 students; the degree of graduate in pharmacy is conferred after examination upon persons who have attained the age of 21 years, have served an apprenticeship of four years with some reputable pharmacist, and have attended two courses of lectures in a recognized college of pharmacy, the last course in this institution; any graduate of good standing, on passing a prescribed examination, is entitled to the degree of master in pharmacy. The Baltimore college of dental surgery, the oldest dental college in the world, was incorporated in 1840; in 1874 it had 9 professors and 578 alumni; the number graduating that year was 19; the number of students in 1872-'3 was 50. Candidates for graduation are required to prepare a written thesis, to pass an examination upon the subjects taught in the college, and to have attended two courses of lectures in the institution; but an equivalent for one course is allowed. The Maryland dental college was established in Baltimore in 1873, with 13 professors. The United States naval academy is situated at Annapolis. (See ANNAPOLIS.)—According to the census of 1870, the number of libraries was 3,353, containing 1,713,483 volumes, of which 2,037, with 1,142,538 volumes, were private. Of those not private, 2, with 31,462 volumes, were state libraries; 1, with 41,500 volumes, city; 20, with 14,662 volumes, court and law;

72, with 98,470 volumes, school, college, &c.; 881, with 215,763 volumes, Sabbath school; and 310, with 90,989 volumes, church. There were 88 newspapers and periodicals, issuing 33,497,778 copies annually, and having a circulation of 235,450, viz.: 8 daily, circulation 82,921; 1 tri-weekly, 5,015; 2 semi-weekly, 1,600; 69 weekly, 127,314; and 8 monthly, 18,600. They were classified as follows: agricultural and horticultural, 2; commercial and financial, 2; illustrated, literary, and miscellaneous, 7; political, 70; religious, 6; technical and professional, 1. The number of church organizations was 1,420, with edifices, sittings, and property as shown in the following table:

DENOMINATIONS.	Edifices.	Sittings.	Value of property.
Baptists, regular.....	58	12,025	\$87,100
" other.....	84	8,705	62,500
Christian.....	5	1,850	23,000
Episcopal.....	155	61,450	1,594,500
Evangelical Association.....	3	1,000	45,500
Friends.....	21	7,440	151,700
Jewish.....	4	2,750	650,000
Lutheran.....	84	40,915	875,100
Methodist.....	757	231,530	3,220,650
Moravian.....	1	500	4,500
New Jerusalem.....	3	900	27,000
Presbyterian.....	77	82,415	1,279,550
Reformed (late Dutch Reformed).....	1	600	15,000
Reformed (late German Reformed).....	42	19,950	562,150
Roman Catholic.....	103	62,250	8,001,400
Unitarian.....	1	800	150,000
United Brethren in Christ.....	34	12,100	233,500
Universalist.....	2	1,000	82,500
Union.....	4	1,500	17,700
Total.....	1,889	499,770	\$12,088,650

—The first settlement in Maryland was made by Capt. William Clayborne with a party of men from Virginia on Kent island, Chesapeake bay, in 1631. But the charter under which the colony was permanently established was granted to Cecilius Calvert, second Lord Baltimore, by Charles I., and was dated June 20, 1632. The province covered by this grant had been partially explored by Sir George Calvert, father of the grantee, four years before. The name first intended for the colony was *Crescentia*, but in the charter it was styled *Terra Maria*, "Mary's Land," in honor of Queen Henrietta Maria. The expedition designed to commence the settlement sailed from the Isle of Wight Nov. 22, 1633, in two vessels named the Ark and the Dove. The emigrants numbered 200, and were nearly all Roman Catholics and gentlemen of fortune and respectability. On March 27, 1634, they commenced a settlement at St. Mary's, near the entrance of the Potomac into Chesapeake bay, within the present limits of St. Mary's co. Leonard Calvert, brother of the lord proprietor, who had conducted the colony from England, became its first governor. A year or two after landing he turned his attention toward Clayborne's settlement; but Clayborne refused to acknowledge himself subject to the new government, and was at length expelled along with his

most active adherents. Under the charter Lord Baltimore had the power of enacting all necessary laws, with "the advice, consent, and approbation of the freemen of the province," or their representatives convened in general assembly. The first assembly met in the beginning of 1635, and submitted certain laws to the approval of the proprietary. A dispute thereupon arose respecting the right of initiative in legislation, which was settled in 1638 by Lord Baltimore's yielding the right to the assembly. (See CALVERT.) In the following year the first statutes of Maryland were enacted. In 1642 a company of Puritans, who had been expelled from Virginia for nonconformity, settled in Maryland, and soon began to manifest a spirit of resistance to the authority of the proprietary. Clayborne also had returned from his exile and regained possession of Kent island. The efforts of the governor to dispossess him not only failed, but Clayborne and his partisans, with the Puritan party, made themselves complete masters of the province, and compelled the governor in his turn to fly into Virginia. This event occurred in 1645. In 1647 the governor returned at the head of a military force and recovered possession. In 1649 the assembly passed an act by which Christians of all sects were secured in the public profession of their faith, and allowed to worship God according to the dictates of their own consciences. The Puritans, whose arrival in the colony has already been noticed, settled at Providence, which at a later period received the name of Annapolis and became the seat of government. They still proved turbulent, and as a means of conciliating them their settlement was erected in 1650 into a separate county under the name of Anne Arundel; and still additional members of this denomination arriving from England, Charles county was organized for them a short time afterward. From this time they began to exercise a controlling influence in public affairs. On the overthrow of the royal government and the establishment of the commonwealth in England, their party insisted upon an immediate recognition of the new order of things; but the authorities proceeded to proclaim Charles II. In the next assembly it was found that the Puritans had a majority; and in 1652 commissioners from England visited Maryland, with whom were associated Clayborne, the old opponent of the proprietary government, and Bennett, the leader of the Puritans of Anne Arundel county. They removed Gov. Stone, who was subsequently reinstated by them, and completely established the authority of the commonwealth. Kent island was once more delivered up to Clayborne, and he acquired also Palmer island at the mouth of the Susquehanna. In 1654 Lord Baltimore made a determined effort to regain possession of the province, and directed Gov. Stone to require all persons to take the oath of fidelity, and to reestablish the proprietary government; but Bennett and Clayborne, the

former of whom was now governor of Virginia, again interfered, and reversed all that Lord Baltimore had accomplished. They established a commission for the government of the colony, and placed Capt. Fuller at its head. Hereupon a civil contest ensued, and hostilities were carried on by land and water. Providence was attacked by the proprietary party, but the Puritans were victorious, and killed or captured the whole invading force. Many of the captives, among whom was Gov. Stone, were condemned to death, and at least four of them were executed. This decisive action was fought March 25, 1655. Three years later the power of the proprietary was completely restored. In 1662 the Hon. Charles Calvert, son of the lord proprietary, was appointed governor, and so continued till 1676, when on the death of his father he succeeded to his rights, and appointed Thomas Notely his representative. After the revolution of 1688 the government was assumed by King William, and in 1691 Sir Lionel Copley was sent out as governor. Among the first acts of importance under the new government was the removal of the capital from St. Mary's to Providence, thenceforth known as Annapolis. In 1714 Benedict Leonard Calvert succeeded on the death of his father to his hereditary rights, and dying the following year was succeeded by his son Charles, a Protestant. The principal obstacle to the recognition of the claim of this family being thus removed, the authority of the proprietary was restored throughout the colony after a suspension of 24 years. Hart, the last of the royal governors, was continued in office. In January, 1730, Baltimore was laid out. In 1745 the "Maryland Gazette," the first newspaper printed in Maryland, was established at Annapolis, and continued to be issued by the descendants of Thomas Green, its founder, until 1839. Frederick City was founded in 1745, and was so named after the son and successor of the then proprietary. Georgetown, now in the District of Columbia, was laid out in 1751, and, being at the head of the navigation of the Potomac, grew rapidly in population and trade. The policy of the English government was to repress all efforts to establish manufactures; but in 1742 copper works were in operation, and in 1749 eight furnaces and nine forges; and wine was produced to a considerable extent. The great staple export, however, was tobacco, of which 30,000 hogsheads were exported annually, and for many purposes tobacco was the currency of the province. In 1732 it was made a legal tender at one penny a pound. Almost from the date of the foundation of the colony disputes with the neighboring provinces regarding boundaries had been a serious cause of disquiet. The boundary with Virginia on the eastern shore was adjusted in 1668 by the running of the "Calvert and Scarbrough" line. That on the side of Delaware and Pennsylvania was not finally settled till 1760, when commissioners were appointed to

run the lines. The Pennsylvania boundary is known as "Mason and Dixon's line," from the names of the surveyors who located it. (See MASON AND DIXON'S LINE.) The W. boundary was surveyed in 1859 by commissioners appointed by Maryland and Virginia. The line along the Potomac remains still formally unadjusted, Maryland claiming the S. branch, and West Virginia the N. branch, while in the main stream Virginia claims the N. bank and Maryland the S. bank as the boundary. This dispute involves valuable riparian rights, and in Chesapeake bay productive oyster fisheries. In the long and bloody contest which annihilated the French dominion in America, Maryland bore an active part. Until the capture of Fort Duquesne in 1758, the western parts of the colony were kept in constant terror, and large numbers sought refuge in Baltimore and other coast towns. The stamp act and the tea duty act were alike opposed by the people of Maryland, and in December, 1774, the proprietary government was practically superseded by a convention of the people. Another convention assembled in August, 1776, and in September presented a bill of rights and a constitution, which were adopted in November. The first elected legislature assembled at Annapolis, Feb. 5, 1777, and on the 13th Thomas Johnson was chosen the first republican governor. Throughout the war the Maryland troops were remarkably efficient, and under the title of the "Maryland line" took a high position in the continental army. In 1783 congress met at Annapolis, and here on Dec. 23 Washington resigned his commission. The federal constitution was adopted in the Maryland convention by a vote of 63 to 11, on April 28, 1788. During the war of 1812, Admiral Cockburn, the British naval officer, committed a series of depredations on the shores of Chesapeake bay, and plundered and burned Frenchtown, Havre de Grace, Fredericktown, and Georgetown. The Maryland militia opposed the march of the British to Washington in 1814, but without effect. On Sept. 12 of the same year was fought the battle of North Point, in which the British general Ross was killed, and the Americans gained a slight advantage; and on the next day the invaders began an attack upon Baltimore by the bombardment of Fort McHenry. The defence was bravely conducted, and on the 16th the British fleet weighed anchor and made sail down the bay. The Baltimore and Ohio railroad was commenced in 1828, and completed to the Point of Rocks on the Potomac in 1832, but it was not opened to Wheeling till 1853. The Chesapeake and Ohio canal was undertaken by a company formed in 1828, and was completed in 1850. In 1802 and 1810 the constitution was amended, and in 1836 it was essentially remodelled. In 1845-'6 it was again amended, and in 1851 a new constitution was adopted. At the beginning of the civil war many citizens of Maryland favored secession, and many subsequently entered the

confederate army. The first hostile demonstration was the attack on the sixth Massachusetts regiment in Baltimore, April 19, 1861. (See BALTIMORE.) The legislature, which met at Frederick on the 26th in pursuance of a proclamation of the governor, refused to pass an ordinance of secession, but took various measures looking to neutrality, and passed resolutions assenting to the independence of the confederate states and opposing the war. At the election which took place in November the Union candidate for governor was elected by a majority of 31,412 in a total vote of 83,584, and a legislature almost unanimously in favor of the Union was chosen. Henceforth the state authorities were active in support of the war, and 49,730 men were contributed by Maryland to the federal armies. In September, 1862, the battle of Antietam, the principal engagement that took place in Maryland, was fought, and in June, 1863, the state was invaded by Lee in his advance into Pennsylvania. Another invasion, under Gen. Early, took place in July, 1864, and a battle was fought on the Monocacy river (July 9). In October, 1864, a new constitution was ratified by the people by a vote of 30,174 to 29,799, which abolished slavery and disfranchised all who had aided or encouraged rebellion against the United States. The present constitution was adopted at an election held on Sept. 18, 1867.

MARY OF BURGUNDY. See MAXIMILIAN I.

MARY OF THE INCARNATION (MARIE GUYARD), an Ursuline nun, called the St. Theresa of New France, born in Tours, France, Oct. 18, 1599, died in Quebec, April 30, 1672. By the will of her father she married at 17 M. Martin, a silk manufacturer. Having been left a widow at 19, she superintended a factory till her son was 12 years of age, and then, on Jan. 25, 1631, entered an Ursuline convent. She went to Canada in 1639, and founded the Ursuline convent in Quebec. She acquired the Huron and Algonquin languages, taught French and Indian pupils, and evinced great judgment and ability in directing her community and in aiding the rising colony. She was one of the first to call the attention of the French government to the vital importance of securing the mouth of the Hudson from the Dutch, if France desired to hold Canada. Her letters, which form a valuable body of contemporaneous information, and are esteemed in a religious point of view, were published in 1681. Her life has been written by her son, the Benedictine Dom Claude Martin (Paris, 1677), by Father Charlevoix (Paris, 1724), and by the abbé Casgrain (Quebec, 1864).

MARY MAGDALENE (probably so called from Magdala, a town of Galilee), a woman mentioned by St. Luke (viii. 2) as "Mary called Magdalene, out of whom went seven devils," among those who accompanied Jesus and "ministered unto him of their substance" (viii. 3). She is commonly supposed to be the same as the "woman, which was a sinner," of whom

St. Luke previously relates (vii. 37, 38) that as Jesus sat at meat in the house of Simon the Pharisee he washed his feet with tears and wiped them with the hairs of her head, and anointed them; but there is no evidence of their identity. The supposition has also been entertained that she is identical with Mary the sister of Martha and Lazarus; but beyond the similarity of name, the affectionate devotion to Jesus Christ which distinguished both, the fact that the sister of Martha also anointed the feet of Jesus, and the opinion of some of the early fathers, among whom is St. Gregory the Great, no foundation for it has been assigned. Origen discusses the opinion fully, and rejects it. Mary Magdalene stood by Jesus on the cross, and was present when Joseph of Arimathea laid him in the sepulchre. On the first day of the week she came early to the tomb, and finding it open ran and told Peter and John that they had "taken away the Lord out of the sepulchre" (John xx. 2). Returning to the place with these apostles, she saw "two angels in white sitting, the one at the head, and the other at the feet, where the body of Jesus had lain" (xx. 12). Immediately afterward Christ himself appeared to her, and announced his approaching ascension. Of her subsequent life nothing is known, but it is the theme of numerous legends. The tradition that she passed the latter part of her life in penitential exercises in the desert was treated by Guido, Correggio, Canova, and many other great masters.

MARY STUART, queen of Scots, born in the palace of Linlithgow in December, 1542, beheaded at Fotheringay castle, Northamptonshire, England, Feb. 8, 1587. The precise date of her birth is unknown, for though it is commonly stated Dec. 8, there seems reason to believe that the event must have occurred on the 11th or 12th of that month; and it was probably antedated on account of the 8th being one of the four great festivals of the Catholic church in honor of the Virgin. She was the daughter of James V., seventh king of the Stuart line, and of Mary of Lorraine, daughter of Claude, duke of Guise, the founder of that family which had so conspicuous a part in the politics of France in the 16th century. Her birth took place at one of the dreariest periods of Scottish history, her father dying when she was but a few days old (Dec. 13), of mortification consequent on the defeats which the Scotch had voluntarily met with from the English at Fala Muir and Solway Moss, the nobles being opposed to his policy. The earl of Arran, head of the house of Hamilton, and heir presumptive to the throne, was made regent by the parliament. Mary was crowned Sept. 9, 1543. The first two years of her life were spent at Linlithgow, and she was then removed to Stirling. Henry VIII. of England demanded her hand for his son, the prince of Wales, afterward Edward VI. At first he was successful, and a treaty was made, July 1, 1543, pro-

viding that Mary should be sent to England when she should have attained the age of 10 years, and that she should marry Edward as soon thereafter as possible. In five months this treaty was broken, the French and Catholic party triumphing over the English and Protestant party. An alliance was made with France, Dec. 15, and Henry declared war against Scotland, which his troops invaded. After his death, the protector Somerset continued his policy, and defeated the Scotch in the battle of Pinkie, Sept. 10, 1547. Meantime the queen had lived at Stirling castle, with her governors, Lords Erskine and Livingston; but after the battle of Pinkie she was taken to the monastery of Inchmahome, on an island in Lake Menteith. Her mother and the regent Arran betrothed her to the dauphin of France, son of Henry II., and she sailed to that country from Dumbarton in July, 1548, and arrived at Brest Aug. 14. She was accompanied by four young ladies, Mary Livingston, Mary Fleming, Mary Beaton, and Mary Seaton, who were called "the four Marys." She was warmly received by Henry II., who treated her as a daughter. The French court was brilliant, learned, and licentious. Mary's Latin master was George Buchanan, one of the first scholars of the 16th century; and Ronsard taught her poetry. At 13 she pronounced a Latin oration which was much applauded. In 1551 her hand was formally demanded of Henry II. for Edward VI., but she herself refused to listen to the demand. The widespread dominion and power of the Spanish branch of the house of Austria having increased the fear of the house of Valois, Henry II. determined to complete his alliance with Scotland, and the dauphin Francis and Mary were married, April 24, 1558. The open conditions of the marriage were honorable to Scotland; but there were two secret acts of grave moment. By the first Mary gave Scotland to the sovereigns of France, in reward for the services which Henry II. and his predecessors had rendered that country against the English; and by the second she provided against the non-execution of the first. She also conveyed to Henry any claims that might accrue to her upon England and Ireland. Henry was to have the usufruct of Scotland until he should have repaid himself for what he had expended in her defence. These debts had never been accepted by Scotland. Mary had secretly protested in advance against the engagements she had entered into with her own subjects, and declared her wish to annex Scotland to France. The Scotch bestowed the crown matrimonial on Francis, and it was provided that all acts should be published in the name of Francis and Mary, king and queen of Scotland, dauphin and dauphiness of Vienne. When Mary I. of England died, November, 1558, Henry II. caused the dauphin to quarter the arms of England with those of Scotland, as he affected to believe that Mary Stuart was

legitimate heir to the English crown, as descended from Margaret Tudor, eldest daughter of Henry VII., Elizabeth, daughter of Henry VIII. by Anne Boleyn, having been declared illegitimate. This act was the cause of most of the trouble that afterward befell the Scottish queen. Henry II. dying July 10, 1559, Mary was queen of France from that date till the death of her husband, Francis II., Dec. 5, 1560. During his short reign the Guises, who led the Catholic party, ruled the king through their influence over his wife, their kinswoman. Suitors for her hand soon appeared—the kings of Sweden and Denmark, and Philip II. of Spain, who wished her to wed his son and heir Don Carlos. She was coldly treated in France, where Catharine de' Medici, never her friend, had control of the government; and she resolved to return to Scotland. In that country the French Catholic party had been overthrown and the English Protestant party had triumphed, aided by Elizabeth's forces. By the treaty of Edinburgh, July 5 and 6, 1560, it was provided, among other things, that the French should leave Scotland, and that the Scotch sovereigns should cease to bear the arms and title of the sovereigns of England. Mary had eluded the ratification of this treaty. When she resolved to return to Scotland, she applied to Elizabeth for a safe-conduct through England, but it was refused, unless she would ratify the treaty of Edinburgh. Mary then embarked at Calais, Aug. 14, 1561, and arrived at Leith on the 19th, escaping the English cruisers. She left France with bitter regrets, and was herself much regretted there. Poets expressed the common feeling, and her own *chanson* bidding adieu to the country is universally known. On her arrival in Scotland, she found the power in the hands of the Protestants, and submitted to what it was impossible to resist. Her chief ministers were her natural brother, the lord James Stuart, and Maitland of Lethington, who were among the ablest statesmen of the century. She expressed herself favorable to toleration, and asked it for herself, but obtained it with difficulty. Her position was one of great embarrassment. Sincerely Catholic, she was the sovereign of a people who had accepted the reformation, and who had displayed the utmost enmity to the old faith. Her joyous modes of life were regarded with abhorrence by most of her subjects, and prepared them to believe the worst that could be alleged against her. Still her reign for some time was prosperous. Her brother, who was at that time attached to her, counselled her wisely and acted vigorously. The rebellious Gordons were conquered. A good understanding with Elizabeth was effected, and preparations for a meeting of the two queens were partially made. Circumstances made it advisable that Mary should marry. Elizabeth wished her to marry the earl of Arran, but to this Mary would not consent. She desired to become the wife of Don Carlos of Spain, and refused the dukes of Ne-

mours and Ferrara; but the Spanish marriage met with so much opposition, both at home and abroad, that she had to abandon all idea of it. She was urged to accept the hand of the archduke Charles, third son of Ferdinand I. (1563), but the proposition found no favor with her. Elizabeth then (1564) suggested Lord Robert Dudley, better known as the earl of Leicester, which Mary regarded as an insult. Mary finally determined to marry the lord Henry Darnley, son of the earl of Lennox. Darnley was nearly related to both queens, as his mother, the countess of Lennox, was the lady Margaret Douglas, daughter of the earl of Angus and of Margaret Tudor, widow of James IV. of Scotland. He was handsome and accomplished, but was fickle and his talents were small. The Catholics favored the match, and the Protestants opposed it; and so powerful were the latter that, headed by the queen's brother, who had been created earl of Murray, and Lethington, they would have triumphed and Mary would have married Leicester, could Elizabeth have been prevailed upon to recognize her as her heir. The Scotch statesmen, who were supported by some of the English statesmen, exerted themselves to have this recognition made; but Elizabeth desired that Mary should first accept Leicester. This caused Mary to persevere in her design, which, however, met with much opposition from Murray and others. Murray retired from the court, nor could Mary induce him to return to her service, or to consent to her marriage with Darnley. Elizabeth continued her opposition to the marriage, and sent to propose to Mary to choose either Leicester, the duke of Norfolk, or the earl of Arundel. But neither her opposition, nor the extreme measures of the church of Scotland, nor the lawless proceedings of Murray and others, could now avail to stop the marriage. Darnley had been created lord of Ardmnanach and earl of Ross, and on July 20, 1565, he was made duke of Albany; and nine days later the marriage took place. On the previous day Mary had conferred on him the title of king. The alliance must have been popular in Scotland, or Mary could not have triumphed in opposition to so many powerful influences; but it caused dismay in England. Murray headed a rebellion, relying on English assistance; but Mary's energetic proceedings led to his prompt defeat, and the assertion of the royal authority. Unfortunately, her success led Mary to entertain the idea of overthrowing Protestantism, whereas she had succeeded only because her subjects had believed her to be upholding the existing system against the designs of a few ambitious and selfish nobles. She put herself in communication with the courts of France and Spain, and with the pope. From Spain and Rome she received some money, but Philip II. could afford her no military assistance, though he intimated that he might furnish it at a future period. Mary now assumed a high tone toward Elizabeth;

and as she was supported by the French and Spanish ambassadors, the English queen had to abate her pretensions. Murray was desirous of pardon, and appears to have been sincerely anxious to return to his allegiance; but Mary was resolved on his destruction, and on that of most of his associates. She was now much under the influence of David Rizzio, one of those clever Italian adventurers who then swarmed over Europe, and who filled every kind of employment in all countries, from that of the statesman to that of the spy. The queen's love for Darnley was of brief endurance, his worthlessness having soon become apparent. They quarrelled, and Darnley affected to believe he had been dishonored by Rizzio. Darnley wished for the crown matrimonial, meaning an equal share in the royal authority, which Mary had promised him in the days of their attachment. This promise she now refused to keep, and Darnley attributed her decision to Rizzio. She had also joined the league of the Catholic sovereigns of the continent to exterminate Protestantism. Darnley entered into a vast conspiracy, of which the murder of Rizzio was a mere item, but the only one that was successfully executed. His chief abettors were Lord Ruthven, the earl of Morton, chancellor of Scotland, the earl of Lennox, Darnley's father, Lethington, Lord Lindesay, and John Knox. The conspiracy was known to Elizabeth and her ministers. On the evening of March 9, 1566, several of the conspirators entered the room where Mary was supping, with Rizzio and others, in Holyrood palace, and dragged the Italian to the entrance of the presence chamber, on the stairs of which he was slain, receiving 56 wounds. Darnley was one of the most active of those who entered the queen's cabinet; he tore Rizzio from the hold he had on the queen's garments, and held her while his associates despatched the Italian. Mary was for a time the prisoner of the conspirators, but by deceiving Darnley she effected her escape. Murray returned, and while she was reconciled to him and his immediate friends, she pursued the murderers of Rizzio with implacable resentment. Seventy of them, headed by Morton, fled to England; Lennox was banished from the court, and Lethington deprived of his office. She no longer disguised her hatred of Darnley. On June 19 she gave birth to her only child, afterward James VI. of Scotland and James I. of England. At this time her connection with the earl of Bothwell commenced. He was powerful, bold, unscrupulous, and accomplished, and it was natural that Mary should wish to secure his services; but her enemies charge that she entertained a criminal passion for him. Be that as it may, she showed him high favor, while she treated her husband more contemptuously than ever. A plan for the destruction of Darnley was formed by Lethington, who wished to gratify the queen by ridding her of her husband, either by divorce or by murder, and to

effect the restoration of Morton and his associates. Bothwell joined the conspiracy, as did other great nobles. Murray did not oppose it. It is charged that it was communicated to the queen, and that she offered no serious opposition to it. A bond to cut off the king, and to protect each other, was drawn up and signed by the conspirators. Morton, on his return, was ready to join them if he could have the queen's written warrant, which Bothwell sought to obtain, but unsuccessfully. Darnley was then ill of the smallpox at Glasgow. There he was visited by Mary, and a reconciliation was apparently effected. On his recovering sufficiently to travel he was removed to the provost's house at Kirk of Field, near Edinburgh, where Mary attended him with much apparent kindness, passing several nights under his roof. This house was blown up by gunpowder on the night of Feb. 9, 1567, while the queen was attending a masquerade at Holyrood palace. Of Bothwell's guilt of this murder there is no doubt whatever, but Mary's part in it is not so clear; and the main point in that "Marian controversy" which has continued to the present time turns upon the question of her participation in Bothwell's conspiracy. The impression at Edinburgh was unfavorable to her, and did not lack expression; and her indifference, and her refraining from any exertion to punish those who were loudly accused by the general voice, deepened the belief in her guilt. Instead of complying with Lennox's demand for the arrest of Bothwell, she heaped favors upon the murderer. Public opinion, as pronounced both at home and abroad, compelled her to order that Bothwell should be tried; but his trial was a mockery, the government acting scandalously in his behalf, and he was acquitted. New and signal marks of favor were bestowed upon him, and the whole power of the government was in his hands. He sought to marry the queen, and was divorced from his wife. At a tavern supper, to which he invited many of the nobles and others, he procured, partly by intimidation and partly by falsehood, their signatures to a bond declaring him innocent, and recommending the queen to marry him. On April 24, while returning from Stirling to Edinburgh, she was seized by Bothwell, and conducted to his castle of Dunbar. She was allowed to return to Edinburgh on May 3, when Bothwell's divorce was completed. Her intention to marry him was then announced. He was made duke of Orkney, and on May 15 they were married. This marriage created universal disgust. A conspiracy which had been formed against Bothwell, composed of the chief nobles, now assumed a serious magnitude, and hostilities broke out early in June. The confederates seized Edinburgh, and when the two armies met on Carberry hill, June 15, Mary was deserted by most of her troops, and was compelled to surrender. Bothwell fled, and never returned. The queen was com-

mitted to Lochleven castle, where on July 24 she signed an act of abdication in favor of her son, and other acts arranging the government, of which Murray was to be the head as regent. These acts were extorted from her, and depended for their validity entirely upon the power of the confederates to maintain their position. On Murray's return from France, he visited Mary, and by working on her fears he had the art to make her request him to accept the regency. Parliament passed an act virtually dethroning the queen, and charging her with being privy to Darnley's murder. On May 2, 1568, she made her escape from Lochleven, and rallied a powerful force to her support, which was defeated at Langside, May 13, by Murray. Mary fled to England, which she entered May 16. There was no occasion for this course, which was the most unwise she could have adopted. At first she was treated with some consideration by Elizabeth, but the latter assumed the part of judge between Mary and her opponents, and affected to decide on her guilt or innocence of the charges preferred against her. The examinations were unfairly conducted, and injured Mary's reputation. During the early years of her residence in England she was variously treated, and it was not till 1573, when her party in Scotland was finally overthrown, that she lost all hope of deliverance from that quarter. She was concerned in various attempts against Elizabeth's government, and sought to marry the duke of Norfolk. She intrigued with the king of Spain, and with other foreigners of eminence, for her liberation. The northern rebellion, headed by the dukes of Northumberland and Westmoreland, which was the last open effort made by the Catholics to restore the old faith, she discouraged. At one time, in 1571, Elizabeth was on the point of restoring her; but in 1572 she engaged in a treaty with the Scotch government for the surrender of Mary, who was to have been tried, condemned, and put to death. This plan failed through the death of the regent Mar, as it had previously failed through the deaths of the regents Murray and Lennox. Her hand was sought by Leicester, by Sir George Carey, a near relative of Elizabeth, and by Don John of Austria. She was confined in various places, her chief custodian being the earl of Shrewsbury. In most cases her treatment was outrageous, and shows the extent of Elizabeth's personal hatred of the woman she had wronged, and that she desired to effect her destruction. Mary was both feared and hated by the reformers, who demanded her death through the ministers of Elizabeth and through parliament. She was believed to be the principal person in all the numerous conspiracies against Elizabeth, though with most of them she could have had no connection. An "association" was formed, directed not only against those who should do violence to Elizabeth, but also against those for whose benefit the crime should be com-

mitted. Parliament sanctioned this association in 1586. Babington's conspiracy was formed in 1586, one of the objects of which was to liberate Mary, who had some correspondence with Babington, in which no encouragement, however, was given to his designs against Elizabeth. This conspiracy early became known to Elizabeth's ministers, who nursed it, until even the queen became alarmed, and compelled the arrest of the assassins. It was then resolved to proceed against Mary, who had been removed to Fotheringay castle, Sept. 25, 1586. A commission, composed of 46 persons, was appointed to try her. At its head was the chancellor, Bromley, and the treasurer, Burleigh, was one of its members. The other members were all persons of eminence, either state officers, or peers, or lawyers. This commission, of which 11 members refused to act, met at Fotheringay castle on Oct. 11, 1586, and, after overcoming Mary's original determination not to acknowledge its jurisdiction, proceeded with the trial on the 14th. She defended herself with skill and success against the great array of talent on the other side, and the commissioners durst not come to a decision in her presence. They adjourned to Westminster, after sitting two days, and on Oct. 25 they unanimously declared her guilty. It was not until Nov. 19 that Mary was informed of their decision, and she heard it with calmness. Efforts to save her life were made by the governments of France and Scotland. The publication of the sentence of death, Dec. 4, in London, was received with extravagant demonstrations of joy. Parliament urged execution. Elizabeth, however, seemed reluctant to proceed to extremities, and for six weeks the warrant for her execution remained unsigned in the hands of Davison; nor is it certain that she ever signed it. A warrant purporting to bear her signature was given by Burleigh and his associates to Beale, Feb. 3, 1587, but there is evidence that it may have borne that signature in consequence of a forgery effected by one Harrison, a clerk in the service of Secretary Walsingham, the most implacable and dishonest of Mary's enemies. An attempt to induce her jailers to poison her, in which Walsingham and Davison were the principal instruments, had failed. On Feb. 7 the earls of Kent and Shrewsbury proceeded to Fotheringay castle, and informed Mary that she must prepare to die the next morning, at 8 o'clock. She was taken by surprise, but bore herself with characteristic firmness. She made all her preparations for death with deliberation, and at the appointed time proceeded to the scaffold, which had been erected in the banquet hall. She was denied the presence of her almoner, and was rudely importuned to change her faith by the bigoted dean of Peterborough, and by the brutal earl of Kent, whose efforts she quietly but firmly repulsed. She died with heroic bravery; and even when the executioner at first struck her on the skull, in-

flicting a horrible wound, she did not shrink or groan. Two more blows were necessary to despatch her. After being contemptuously neglected for six months, her remains were buried in Peterborough cathedral, Elizabeth acting as chief mourner through Lady Bedford; and 25 years afterward they were removed to Henry VII.'s chapel, in Westminster abbey, by order of her son James I. When Elizabeth was informed of Mary's death, she expressed great indignation, forbade Burleigh and Walsingham her presence as the sole authors of the crime, and sent their principal tool, Secretary Davison, to the tower, and had him fined £10,000. Davison's word is all the evidence that exists of Elizabeth having signed the warrant, and he was not only a witness in his own cause, but had been concerned in an attempt to induce Mary's jailers secretly to poison her.—The question of Mary's guilt or innocence of the crimes charged against her has been vehemently debated for three centuries, and hundreds of works have been written on it, while she has been a favorite character with poets and novelists. The question seems no nearer to a solution now than it was in the early days of her residence in England, when it was debated by George Buchanan on the one side, and by Lesley, bishop of Ross, her champion, on the other. Among the numerous works in relation to Mary, we cite those of Lesley, "Defence of the Honor of Marie, Queene of Scotland and Dowager of France" (London, 1569); George Buchanan, *De Maria Scotorum Regina*, &c. (London, 1571; translated into English by Robert Leckprevik, and also into French); William Udall, "Historie of the Life and Death of Mary, Queen of Scotland" (London, 1624); William Sanderson, "Compleat History of the Lives and Reigns of Mary, Queen of Scotland, and of her son James VI." (London, 1656); "The Genuine Letters of Mary, Queen of Scots, to James, Earl of Bothwell," translated from the French originals by Edward Simmonds (Westminster, 1721); Jebb, "History of the Life and Reign of Mary, Queen of Scots and Dowager of France, extracted from original Records," &c. (London, 1725); James Anderson, "Collections relating to the History of Mary, Queen of Scotland" (Edinburgh, 1727-'8); De Marsy, *Histoire de Marie Stuart* (London and Paris, 1742-'3); Goodall, "Examination of the Letters said to be written by Marie, Queen of Scots, to James, Earl of Bothwell; also an Enquiry into the Murder of King Henry" (Edinburgh, 1754); Robertson, "History of Scotland during the Reigns of Queen Mary and of James VI." (London, 1759); Tytler, "An Enquiry, Historical and Critical, into the Evidence of Mary, Queen of Scots" (Edinburgh, 1759); Whitaker, "Mary, Queen of Scots, Vindicated" (London, 1788); Thomas Robertson, "History of Mary, Queen of Scotland" (Edinburgh, 1793); George Chalmers, "Life of Mary, Queen of Scots," &c. (Lon-

don, 1818); Miss Benger, "Memoirs of Mary Stuart" (London, 1822); Hugh Campbell, "The Case of Mary, Queen of Scots, and of Elizabeth, Queen of England," and "Love Letters of Mary, Queen of Scots, and the Earl of Bothwell" (London, 1825); Miss Strickland, "Letters of Mary, Queen of Scots" (London, 1842), and "Lives of the Queens of Scotland" (Edinburgh, 1850-'56); Prince Labanoff de Rostov, *Lettres, instructions et mémoires de Marie Stuart* (7 vols., London, 1844; English translation, 1845); Dargaud, *Histoire de Marie Stuart* (Paris, 1850); Chéruel, *Marie Stuart et Catherine de Médicis* (Paris, 1858); Teulet, *Lettres de Marie Stuart* (Paris, 1859); Joseph Robertson, "Catalogues of the Jewels, Dresses, Furniture, Books, and Paintings of Mary, Queen of Scots" (Edinburgh, 1863); Flandre, "History of Mary Stuart, Queen of Scots," translated from the manuscript of Prof. Petit (2 vols., London, 1874); Hosack, "Mary, Queen of Scots, and her Accuser" (2d ed., London, 1874); and "The Letter Books of Sir Amias Poulet, Keeper of Mary, Queen of Scots," edited by John Morris (London, 1874). See also Froude's "History of England," vols. vii.-xii. (London, 1870), and Meline, "Mary, Queen of Scots, and her latest English Historian" (New York, 1871).

MARYSVILLE, a city and the capital of Yuba co., California, situated at the junction of the Feather and Yuba rivers, on the Oregon division of the Central Pacific railroad at the intersection of the California Northern line, 50 m. N. of Sacramento, and 110 m. N. N. E. of San Francisco; pop. in 1870, 4,738, of whom 1,417 were Chinese. It stands on a level plain. The streets are broad and regular, and the houses are generally built of brick. The Central Pacific railroad crosses the Yuba on a fine bridge. The Feather river is navigable at all seasons to this point by steamers of light draught. The city is the centre of a large trade with the mining districts of the Sierra Nevada. There are several flouring mills, breweries, carriage factories, a foundery and machine shop, a woollen factory, &c., a savings bank, and three private banks. The public schools are graded, including a high school department, and have an average attendance of about 500 pupils. There are eight or ten private schools and academies, with an average attendance of about 250. The city has a newspaper, issuing daily and weekly editions, and eight churches. It was laid out in 1849, and incorporated in 1851.

MARYVILLE, a town and the capital of Blount co., Tennessee, on the Knoxville and Charleston railroad, 16 m. S. by W. of Knoxville; pop. in 1870, 811, of whom 103 were colored. It is the seat of Maryville college (Presbyterian), founded in 1819 and chartered in 1842. The college embraces the ordinary collegiate course of four years, a ladies' course of four years, preparatory courses, and an English course of three years. In 1873-'4 it had 3 professors, 6 instructors, 131 students (collegiate, 25; preparatory, 24; ladies' course,

22; English course, 60), and a library of 2,000 volumes. The grounds embrace 65 acres, and contain three buildings, recently erected at a cost of \$50,000. The situation is noted for its healthfulness and beauty.

MASACCIO, a Florentine painter, whose real name was **TOMMASO GUIDI**, born at San Giovanni, near Florence, early in the 15th century, died in 1443. He is said to have been a pupil of Masolino da Panicale, and from his personal habits was called **Tommasaccio** (shortened to **Masaccio**), "slovenly Thomas." While a young man he visited Rome, and painted there in the chapel of Santa Caterina in the church of San Clemente a series of frescoes from the life of St. Catharine, and other subjects, which are the earliest works ascribed to him with any certainty. In 1434 he returned to Florence. His frescoes illustrating the life of St. Peter, in the Brancacci chapel of the Carmelite church, introduced a marked improvement in painting. The subjects were the "Expulsion of Adam and Eve from Paradise," the "Tribute Money," "Peter raising a Youth to Life," "Peter and John healing the Cripple," "Peter and John distributing Alms," and "Peter baptizing Converts," in which the figure of a young man who has thrown off his garment and is shivering with sudden cold is celebrated in the history of art.

MAS Á FUERA. See **CHILI**, and **JUAN FERNANDEZ**.

MASANIELLO (a contraction of **TOMMASO ANIELLO**), an Italian popular leader, born in Amalfi in 1620, assassinated in Naples, July 16, 1647. He was a fisherman, but headed a successful revolt against the duke of Arcos, who as viceroy of Philip IV. of Spain, in order to defray the expenses of a war against France, had levied a tax on fruit and vegetables, the food of the common people. On July 7, 1647, a dispute in the market place as to which of two parties should pay the odious tax collected a crowd, into which Masaniello, who was a great favorite with the populace, ran shouting, "No taxes, no taxes! long live the king of Spain! down with the bad government!" After speaking a few eloquent words, he was made by acclamation chief of the angry populace, which poured through the streets, demolishing the tax gatherers' houses, burning palaces, opening prisons, and driving the viceroy into the castle. An impromptu commonwealth was organized, and Masaniello was proclaimed "captain general of the Neapolitan people." After an unsuccessful attempt by some nobles to make away with him, which resulted in the slaughter of the would-be assassins, the viceroy accepted articles drawn up by the insurgents, which abolished the imposts upon eatables, restored the privileges bestowed by Charles V., and granted a general amnesty, the Neapolitans to remain in arms until the articles should have been ratified by the king of Spain. This negotiation completed, Masaniello threw off the rich robes he had assumed, declared himself again a fish-

erman, and knelt at the feet of the cardinal archbishop of Naples. But the people would not suffer him to resign. The next day, after a feast with the duke of Arcos, he became delirious, whether from the effects of over-good fortune or of poison, and his whole nature changed. The reign of freedom now rapidly became a reign of terror. For four days longer the people obeyed him; but on July 16, nine days after he became chief, he was assassinated in a convent, where he had taken refuge from their jeers. His body was dragged through the streets and subjected to all kinds of outrage, and his head was sent to the viceroy. The next day head and body were put together by the fickle populace, who, to the number of 80,000, followed the remains to the tomb, where military honors were paid by order of the viceroy. He was killed as a tyrant, but was subsequently revered by the people as a liberator. Auber's opera of *La muette de Portici*, also known as *Masaniello*, is founded upon his nine days' career. Carrafa de Colobrano also wrote an opera, *Masaniello*, which is now obsolete.

MAS Á TIERRA. See **JUAN FERNANDEZ**.

MASAYA, an inland city of Nicaragua, in the department of Granada, 15 m. S. E. of Managua; pop. about 12,000, nearly all Indians. It has not a single public edifice worthy of notice; but the suburbs, consisting of immense flower and fruit gardens dotted with Indian huts, are remarkably picturesque. The water supply is raised by a steam pump to the town, from a lagoon of the same name, with an area of 10 sq. m., a short distance S. of and 368 ft. lower than Masaya. The chief industries are agriculture, and the manufacture of earthenware, hats, mats, hammocks, and some cotton and pita tissues. The feast of San Gerónimo, the patron of one of the four cantons into which the town is divided, is annually attended by about 50,000 persons. In the vicinity is a volcano of the same name, 2,972 ft. high, the last great eruption of which occurred March 16, 1772, when a torrent of lava was poured out, which covers a portion of land 2 m. wide, forming a gloomy barren waste in the midst of the luxuriant vegetation by which it is surrounded. Not far from the city are rocks and ruins covered with antique red paintings and rude hieroglyphics.

MASCAGNI, Paolo, an Italian anatomist, born at Castello, near Siena, in 1752, died in Florence, Oct. 19, 1815. He became professor of anatomy at the university of Siena in 1774, and in 1784 obtained a prize from the French academy of sciences. In 1787 appeared his most important work, *Vasorum Lymphaticorum Corporis Humani Historia et Iconographia*. From 1801 till his death he was professor of anatomy, physiology, and chemistry in the hospital of Santa Maria at Florence. He left *Anatomia per uso degli studiosi di scultura e pittura* (Florence, 1816), and *Anatomia universa*, with illustrations (Pisa, 1823-'31).

MASCARA, a town of Algeria, in the province and 45 m. S. E. of the city of Oran; pop. in 1866, 9,442. It has two public squares, two market places, a mosque, and carpet factories. It was the residence of Abd-el-Kader, and in 1835 was burned down by the French. Subsequently it was rebuilt, and it is now an important emporium of inland trade.

MASCARENE ISLES, the name of a group of islands in the Indian ocean including Mauritius (formerly Isle of France) and Rodriguez, which belong to Great Britain, and the French island of Réunion (formerly Bourbon). The name is derived from that of Mascarenhas, the Portuguese discoverer of the group.

MASCOUTINS, an Algonquin tribe, near Lake Michigan, who figure largely in early French accounts. They were closely united with the Foxes and Kickapoos, and when first known to the French, about 1620, were at war with the Ottawas and even with the Neutral Nation on Niagara river. Allouez in 1669 found them on the Wisconsin, and later they were on the Fox. Some at a still later day removed to the Ohio. In 1712 they joined the Foxes and Kickapoos against the French, and maintained a hostile attitude till the close of the French rule. They showed similar hostility to the English, attacking Col. Croghan near the Wabash in 1765; and to the Americans, attempting to cut off Clarke by treachery in 1777. In all these operations they appear acting with one of their kindred tribes, and in this century are never treated as a distinct body. The Hurons called them Asistaeronon, or Fire Nation, but some writers at an early date declared the translation erroneous, and maintained that the name Mascoutin meant prairie.

MASÈRES, Francis, commonly called Baron Masères, an English mathematician, born in London, Dec. 16, 1731, died at Reigate, May 19, 1824. He was educated at Cambridge, studied law, and after a few years' practice was appointed attorney general for Canada, and resided in Quebec till 1773. After his return to England he recommended conciliatory measures with the American colonies, and was appointed to the sinecure office of cursor baron of the exchequer. He wrote "The Elements of Plane Trigonometry" (1750); a treatise against the abuse of the negative sign in algebra (1758); a learned treatise on "Life Annuities" (1783); and numerous papers in the "Philosophical Transactions." He also published *Scriptores Logarithmici* (6 vols., 1791-1807), and *Scriptores Optici* (1823).

MASHAM, Abigail, lady, the favorite of Queen Anne of England, born about 1670, died Dec. 6, 1734. The place of her birth was probably London, where her father, Francis Hill, was a merchant, and married the aunt of the duchess of Marlborough, a Miss Jennings. He ruined himself by becoming a speculator, and Abigail, his eldest daughter, became a waiting woman to the wife of Sir John Rivers. When the duchess of Marlborough learned of the pov-

erty of her relatives, the Hills, she afforded them great assistance. By her influence Abigail was appointed bedchamber woman to the princess; but the arrogance of the duchess offended all the recipients of her bounty. Availing herself of her confidential position in the service of Anne, who had become queen, Abigail Hill was steadily undermining the duchess of Marlborough at court. Samuel Masham, a gentleman of the bedchamber to the prince of Denmark, became attached to Abigail, and the queen was the confidante of their courtship, of which the Marlboroughs knew nothing. Anne was present at their marriage, which took place in 1707. After a long and bitter struggle, the Marlborough influence was overthrown, the high ministry was dismissed, and the Tories came into power, and made the treaty of Utrecht with Louis XIV. At the close of 1711 her husband was made Baron Masham of Otes, being one of the twelve peers created to enable the Tory ministers to force their measures through the house of lords. In the quarrel between Oxford and Bolingbroke, Lady Masham sided with the latter. On the death of Queen Anne in 1714, her court favor came to an end, and she and her husband retired to their seat at Otes.

MASINISSA, or **Massinissa**, a king of Numidia, born about 240 B. C., died in 148. He was the son of Gala, king of the Massylians, the most powerful tribe in E. Numidia, and received a superior education at Carthage, which when he reached the age of manhood commenced its second great struggle against Rome, under the lead of Hannibal. The Carthaginians prevailed on the Massylians to declare war against Syphax, king of the Massesylians, a rival Numidian tribe, who had espoused the cause of the Romans. Masinissa commanded his father's army, routed Syphax (218), and crossed over to Spain, where the Numidian horse greatly contributed to the defeat of the brothers Cneius and Publius Scipio. Scipio Africanus the elder, by the return of Massiva, the captive nephew of the Numidian, to his uncle with presents and a courteous message, paved the way for a secret understanding with the latter, which proved disastrous to Carthage when Scipio finally carried the war into Africa. Masinissa is said to have been influenced by resentment against Hasdrubal, who had betrothed to him his daughter Sophonisba, but in order to gain over Syphax broke his promise and gave her to the latter. Returning to Africa, where his father had in the mean while died, Masinissa reconquered his kingdom from a usurper, but was soon attacked by the Carthaginians and their new ally, was repeatedly routed, and saved his life by flight. At this juncture Scipio landed in Africa (204), and Masinissa was enabled not only to regain his possessions, but while assisting his victorious allies, jointly with Lælius, one of their commanders, took Cirta, the capital of Syphax. Sophonisba became his captive, and soon his

wife. Being afraid of the influence of Hasdrubal's daughter over her new consort, Scipio severely reprimanded Masinissa, and asked the surrender of the Carthaginian woman as a captive of Rome. Unable or unwilling, at the risk of his power, to defend the freedom of his wife, Masinissa saved her from the ignominy of Roman captivity by sending her a cup of poison, which she drank without hesitation. Syphax was sent to Italy, where shortly after he died. In spite of his tragic loss, Masinissa from ambition persisted in his fidelity to Rome, and his aid contributed not a little to the issue of the battle of Zama (202), in which he commanded the cavalry on the right wing of Scipio's army, and which terminated with the rout of Hannibal. Peace was concluded soon after (201), and Masinissa was rewarded by the victors with a part of the territories of Syphax. He reigned in peace for 50 years, developing the resources of his kingdom by the promotion of agriculture, and extending its limits by annexations from the possessions of Carthage, which were approved of by the senate of Rome, and in consequence of which a few years before his death he once more entered the field of battle, when over 90 years old. His defeat of the Carthaginians made it easier for the Romans subsequently to conquer them; and the last Punic war commenced soon after, in the second year of which Masinissa died, leaving his possessions to be divided by Scipio among his three legitimate sons Micipsa, Gulusa, and Mastanabal, with rich donations to their very numerous illegitimate brothers.

MASK, Iron. See IRON MASK.

MASKELL, William, an English clergyman, born in Bath in 1814. He graduated at University college, Oxford, in 1836, took orders in 1837, and became rector of Corcombe, Dorset, in 1842, chaplain to the bishop of Exeter in 1846, and vicar of St. Mary's, Devon, in 1847. In 1849, the "Gorham case" having been decided against Mr. Maskell's views, he resigned his preferments, and, after an animated correspondence with the archbishop of Canterbury, became a Roman Catholic. His principal works are: "Ancient Liturgy of the Church of England" (1844); *Monumenta Ritualia Ecclesiae Anglicanae* (3 vols., 1846-'7); "Dissertation on Holy Baptism" (1848); "Letter on the Temporal Power of the Pope and his Personal Infallibility" (1869); and "Odds and Ends" (stories, &c., 1872).

MASKELYNE, Nevil, an English astronomer, born in London, Oct. 6, 1732, died at Greenwich, Feb. 9, 1811. He graduated at Cambridge in 1754, took orders, officiated for some time as curate, and obtained a fellowship in 1756. In 1758 he became a fellow of the royal society, and in 1761 was sent to St. Helena to observe the transit of Venus. Soon after returning he was sent out to Barbadoes on board the Princess Louisa, to test the merits of Harrison's new chronometers and Irvine's marine chair. In 1765 he became astronomer royal at

Greenwich. In 1772 he went to Scotland to determine the mean density of the earth by observing the effect of the mountain Schehallien upon the plumb line. He superintended the "Nautical Almanac," established at his suggestion, from 1767 till his death. He was the first to publish what is termed "a standard catalogue of stars."

MASKINONGÉ, a S. W. county of Quebec, Canada, bounded S. E. by Lake St. Peter, an expansion of the St. Lawrence river; area, 3,221 sq. m.; pop. in 1871, 15,079, of whom 14,782 were of French origin or descent. It is drained in the N. W. by the Gatineau and Du Lièvre rivers, and in the S. E. by the Maskinongé and Du Loup rivers and other streams. Capital, Rivière du Loup.

MASON, the name of six counties in the United States. **I.** A W. county of West Virginia, bounded N. and W. by the Ohio river, and drained by the Great Kanawha and its tributaries; area, 300 sq. m.; pop. in 1870, 15,978, of whom 534 were colored. It has a diversified surface and fertile soil, and contains iron ore, coal, and valuable salt springs. The chief productions in 1870 were 115,350 bushels of wheat, 456,990 of Indian corn, 43,464 of oats, 84,534 of potatoes, 58,600 lbs. of tobacco, 22,853 of wool, and 4,353 tons of hay. There were 2,563 horses, 2,332 milch cows, 5,183 other cattle, 9,880 sheep, and 9,879 swine. Capital, Point Pleasant. **II.** A W. central county of Texas, intersected by the Rio Llano, a branch of the Colorado, and watered by affluents of the Llano and the San Saba; area, 910 sq. m.; pop. in 1870, 678, of whom 26 were colored. About one tenth of the surface is prairie, and the rest timbered. Two thirds is suitable for farming. Stock raising is the principal business. The chief productions in 1870 were 7,740 bushels of Indian corn, 593 of sweet potatoes, 5,510 lbs. of wool, 6,945 of butter, and 141 tons of hay. There were 183 horses, 19,703 cattle, 1,943 sheep, and 2,329 swine. Capital, Mason. **III.** A N. E. county of Kentucky, bordering on the Ohio river, intersected by the N. fork of Licking river, and drained by Limestone and Lee's creeks; area, 236 sq. m.; pop. in 1870, 18,126, of whom 3,582 were colored. The surface is diversified, hilly toward the north, and the soil fertile. The chief productions in 1870 were 72,850 bushels of wheat, 54,450 of rye, 765,000 of Indian corn, 45,076 of oats, 42,140 of barley, 41,731 of potatoes, 1,593,156 lbs. of tobacco, 19,178 of wool, 106,329 of butter, and 4,744 tons of hay. There were 4,132 horses, 1,361 mules and asses, 2,598 milch cows, 5,221 other cattle, 5,659 sheep, and 18,202 swine; 2 manufactories of agricultural implements, 9 of carriages and wagons, 1 of cotton goods, 2 of woollen goods, 2 breweries, and 2 saw mills. Capital, Maysville. **IV.** A central county of Illinois, bounded N. W. by the Illinois and S. by the Sangamon rivers; area, 580 sq. m.; pop. in 1870, 16,184. The surface is low, and

the soil, which is mostly prairie, very fertile. The Peoria, Pekin, and Jacksonville, the Springfield and Northwestern, and the Jacksonville division of the Chicago and Alton railroad pass through it. The chief productions in 1870 were 198,889 bushels of wheat, 49,182 of rye, 2,648,726 of Indian corn, 272,660 of oats, 71,345 of potatoes, 231,960 lbs. of butter, and 8,943 tons of hay. There were 6,541 horses, 1,988 mules and asses, 4,217 milch cows, 6,097 other cattle, 1,968 sheep, and 16,654 swine; 7 manufactories of carriages, 4 of brick, 9 of saddlery and harness, and 5 flour mills. Capital, Havana. **V.** A W. county of Michigan, bordering on Lake Michigan, and drained by the Notipeskago, Marquette, and Great and Little Sable rivers; area, 460 sq. m.; pop. in 1870, 3,263. The surface is generally level and the soil fertile. The chief productions in 1870 were 4,768 bushels of wheat, 12,261 of Indian corn, 9,457 of oats, 37,515 of potatoes, and 636 tons of hay. There were 168 horses, 273 milch cows, 520 other cattle, and 745 swine. Capital, Père Marquette. **VI.** A W. county of Washington territory, having Puget sound on the E.; area, 1,600 sq. m.; pop. in 1870, 289. The Olympus and Coast mountains extend through it, and between and among them are several broad and fertile valleys. Some lumbering is carried on. The many inlets of the sound afford good harbors. The chief productions in 1870 were 1,000 bushels of oats, 2,350 of potatoes, and 412 tons of hay. The value of live stock was \$14,250. Capital, Oakland.

MASON, the name of a family of Virginia. The first of the family who came to North America was Col. George Mason, a member of the English parliament in the reign of Charles I. He opposed the arbitrary policy of the king, but resisted extreme measures against him. He was an officer in the army of Charles II., and after his defeat in Worcester in 1651 escaped to Virginia, losing all his possessions in England. His great-grandson, of the same name, about 1726 married Anne Thomson, a favorite niece of Sir William Temple, and had by her two sons and a daughter. **I. George**, eldest son of George Mason and Anne Thomson, born at Doeg's Neck, in Stafford, now in Fairfax co., Va., in 1726, died in the autumn of 1792. In 1769 he drew up the non-importation resolutions which were presented by Washington and adopted by the assembly of Virginia. In 1775 the convention of Virginia made him a member of the committee of safety charged with the executive government of the colony. In 1776 he drafted the declaration of rights and the constitution of Virginia, which were adopted by a unanimous vote. He brought forward and carried through, in conjunction with Jefferson, a measure for the repeal of the old disabling acts, and for legalizing all modes of worship, releasing dissenters from parish rates. In 1777 he was elected a member of the continental congress; and ten years later he was a leading member of the

federal convention to frame the constitution of the United States, in which he took decided ground against all measures tending to the perpetuation of slavery. He was dissatisfied with the instrument when completed, and declined to sign it, declaring his apprehensions that it would result in a monarchy or a tyrannical aristocracy. Returning to Virginia, he was chosen a member of the convention called to ratify or reject the federal constitution, and in conjunction with Patrick Henry he led the opposition to the constitution in that body, insisting upon about 20 alterations, several of which were afterward adopted by congress and the states. He was elected the first United States senator from Virginia under the constitution, but declined to accept the office. His statue stands with those of Jefferson, Henry, and other illustrious Virginians, at the base of Crawford's colossal statue of Washington in front of the capitol at Richmond. **II. Thomson**, younger brother of the preceding, born in 1730, died in 1785. He studied law in the Temple at London. He took strong ground against the aggressions of the British government, and as early as 1774 published a series of papers in which he maintained the duty of open resistance. The first numbers of these papers appeared under the signature of "A British American," but in the concluding one he made known his real name. In 1778 he was appointed a member of the first supreme court of Virginia, and was soon afterward with his brother nominated by the senate one of the revisers of the laws of Virginia. In 1779 he was elected a member of the house of delegates for Elizabeth City county. He was again a member in 1783, and served as chairman of the committee on courts of justice. **III. Stevens Thomson**, eldest son of the preceding, born in Stafford, Va., in 1760, died in Philadelphia in 1803. At the age of 20 he reached the rank of colonel in the revolutionary army. He was a member of the Virginia convention in 1788, and of the United States senate from 1794 until his death. He was distinguished for wit and eloquence. **IV. Armistead Thomson**, son of the preceding, born in London co., Va., in 1787, killed Feb. 5, 1819. He served during the war of 1812 as colonel of a regiment of horse, and was subsequently a brigadier general of the Virginia militia. He was a member of the Virginia legislature, and in 1815-'17 of the United States senate. As it was supposed that he alone, on account of his great personal popularity, could break down the federal champion Charles Fenton Mercer, he resigned from the senate to become a candidate for the house of representatives in the district of London; but he was defeated by a small majority. The contest was bitter, and resulted in several duels; among them was the famous conflict in which he himself was involved with his cousin Col. John Mason McCarty, in which he was killed. He left an only child, Stevens Thomson, who

volunteered in the Mexican war, and as a captain of the mounted rifles was mortally wounded at Cerro Gordo. **V. Richard B.**, grandson of George Mason, an officer of the United States army, died at Jefferson barracks, Mo., in 1850. He served in the Mexican war as colonel of dragoons, and was brevetted brigadier general in 1848 for "meritorious and distinguished" services. He was the first civil and military governor of California. **VI. James Murray**, also a grandson of George Mason, born on Analoostan island, opposite Washington, Nov. 3, 1798, died near Alexandria, Va., April 28, 1871. He studied law, and in 1820 commenced practice in Winchester, Va. In 1826 he was elected to the Virginia house of delegates, and was twice reelected. In 1837 he was chosen a member of the lower house of congress. He declined a reelection and returned to the practice of his profession. In 1847 he was appointed to the United States senate to fill a vacancy, and in 1849 and again in 1855 was reelected. He took a prominent part in the secession movement, and in July, 1861, was expelled from the senate. He was appointed confederate commissioner to England and France, and on Nov. 8, 1861, with his colleague John Sli-dell, was captured in the Bahama channel on board the British mail steamer Trent, by Capt. Wilkes. He was confined in Fort Warren, Boston harbor, till Jan. 2, 1862, when he was given up to the British government. During the remainder of the war he resided mainly in Paris, as representative of the confederacy. After its close he went to Canada, where he remained three years, and then returned to Virginia. **VII. Stevens Thomson**, grandson of Stevens Thomson Mason, already mentioned, born in Loudon co., Va., in 1811, died in New York in January, 1843. His father, John T. Mason, removed to Kentucky, where the son was educated. In 1831 he was appointed secretary of the territory of Michigan, and on the translation of Gov. Cass to the war department at Washington, he became the acting governor. He held this office during the Ohio and Michigan boundary controversy, which excited intense interest and bitter feeling; thousands of troops were marched to the line with the prospect of a sanguinary conflict. When Michigan organized itself as a state in 1835, he was unanimously elected her first governor, and was reelected for a second term. On retiring from office in 1839, he withdrew from political life, and removed to New York, where he practised law. **VIII. John Y.**, descended more remotely from the same stock as the above, born in Greensville, Va., April 18, 1799, died in Paris, Oct. 4, 1859. He graduated at the university of North Carolina, studied law, was for ten years a delegate in the Virginia general assembly, and filled several other offices in the state. He was a representative in congress from 1831

to 1837, when he was appointed judge of the United States court for Virginia. He was secretary of the navy under President Tyler, and successively attorney general and secretary of the navy under President Polk. By President Pierce he was appointed minister to France, where he continued until his death.

MASON, Francis, an American missionary, born in York, England, April 2, 1799, died in Rangoon, Burmah, March 3, 1874. His father was a shoemaker, but seems to have been also a Baptist preacher. Young Mason was withdrawn from the parish school to work at his father's trade. While engaged in this employment at Hull, whither his father had removed, he obtained a work on geography containing also an outline of astronomy, and was thus led to attend an evening school, where he acquired a knowledge of algebra, geometry, and trigonometry. In 1818 he came to the United States, went at once to the west, and worked as a shoemaker in various places. He went to Boston in 1824, and worked at his trade in Randolph and in Canton, Mass. At Canton he married, united with the Baptist church, and studied languages with his minister. He entered Newton theological institution in 1827, and in 1830 was sent by the American Baptist missionary union to Burmah. He labored among the Karens, a wild tribe, of whom thousands have since been converted, translating the Bible into two dialects of their language, conducting a seminary for the education of preachers and teachers, and preparing books for their use. In the intervals of his regular labors he gathered specimens of plants, made numerous notes, and published in 1852 a work on the natural productions of Burmah, begun with a view to translating the names of natural objects into the vernacular, which Dr. Hooker pronounced "the most valuable addition to the history of the fauna and flora of British Burmah, of any man of modern times." A second edition was published under the title, "Burmah: its People and Natural Productions" (8vo, Rangoon, 1860). He was on his way to Calcutta to superintend a revised edition, when he was arrested by his last sickness. He had also published a grammar, chrestomathy, and vocabulary of the Pali language, besides translations from the Burman, Pali, and Sanskrit, and a "Life of Ko-Thah-Byu," republished in Boston as "The Karen Apostle," a "Memoir of Mrs. Helen M. Mason" (New York, 1847); a "Memoir of San Quala" (Boston, 1850); and an autobiography, "The Story of a Working Man's Life, with Sketches of Travel" (New York, 1870). He received the degree of D. D. from Brown university.

MASON, Jeremiah, an American lawyer, born in Lebanon, Conn., April 27, 1768, died in Boston, Oct. 14, 1848. His father, Col. Jeremiah Mason, was an officer in the revolutionary army, and commanded a company of minutemen at the siege of Boston. He graduated at Yale college in 1788, was admitted to the

bar in June, 1791, and opened an office at Westmoreland, N. H. In 1794 he removed to Walpole, and in 1797 to Portsmouth. In 1802 he was appointed attorney general of New Hampshire, and soon became the acknowledged head of his profession in the state. In 1813 he was chosen to the United States senate, and he took a leading part in the debates of that body on the subjects connected with the war of 1812, delivering important speeches on the embargo in February, 1814, and on the conscription bill in December, 1815. In 1817 he resigned his seat in the senate, and resumed practice. He was afterward for several sessions a member of the legislature of New Hampshire, in which he took a leading share in the revision of the state code of legislation. He drafted the resolutions and report of the legislature on the Virginia resolutions touching the Missouri compromise. In the summer of 1832 he removed to Boston, and continued to practise in the courts till he entered his 70th year. As a lawyer he contended on equal terms with such men as Chief Justice Parsons, Judge Story, and Daniel Webster.

MASON, John, major of the forces of Connecticut colony, born in England in 1600, died in Norwich, Conn., in 1672. He served in the Netherlands as a volunteer under Sir Thomas Fairfax, and about 1630 emigrated to Dorchester, Mass., whence in 1635 he removed to Connecticut, and aided in founding the town of Windsor. The settlers were in constant dread of the Pequot Indians, who inhabited a tract of country lying between the Pequot river, now called the Thames, and the territories of the Narragansetts in Rhode Island. The slaughter of a party of whites at Wethersfield in April, 1637, at length called for retaliatory measures; and at a general court convened in Hartford, Mason was commissioned, with a force of 90 men, to descend the Connecticut and attack the Pequots at the mouth of the Pequot river. Accompanied by 70 friendly Indians of the Mohegan tribe, he reached the English fort at Saybrook, at the mouth of the Connecticut, in the middle of May, and thence put off into Long Island sound, intending to follow the coast to the country of the Narragansetts, and thence by a retrograde march along the shore fall upon his enemies unawares. On the 28d he landed in Narragansett bay, near Point Judith, secured the cooperation of 200 Narragansetts, and having sent back his boats to meet him at the mouth of the Pequot, proceeded by quick marches to the Mystic river, in the neighborhood of which were the two principal forts of the Pequots. Although his Indian allies were now swelled in numbers to about 500, such was their terror of the Pequots that Mason was compelled to commence the attack almost unaided. Before daybreak on the 26th he surprised the nearest fort, and, gaining an entrance within the palisades, fell sword in hand upon the enemy. But finding it difficult to dislodge the Indians, he set fire to their wig-

wams, the whites and their allies forming a circle around the fort to prevent escape. Between 600 and 700 Pequots perished, 7 were captured, and 7 escaped. Of the English 2 were killed and 20 wounded. He then marched to the mouth of the Pequot river, into which his vessels sailed soon after. They were attacked on the way by 300 Indians from the other fort, who however soon retired. Mason, putting his wounded aboard the vessels, marched with a small party by land to Saybrook. Aided by a party from Massachusetts, he then pursued the remnant of the Pequots toward New York, killed and captured many more, and divided the few who remained in Connecticut between the Mohegans and Narragansetts, stipulating that the very name of Pequot should become extinct. He thus secured a general peace with the Indians, which remained unbroken for 40 years. After the Pequot war he removed to Saybrook, at the request of its settlers, for the defence of the colony, whence in 1659 he removed to Norwich. He was major of the colonial forces more than 30 years, and between 1660 and 1670 he was deputy governor of Connecticut. He was also a magistrate from 1642 to 1668. At the request of the general court of Connecticut, he prepared an account of the Pequot war, published by Increase Mather in 1677, and republished, with an introduction and notes by the Rev. Thomas Prince (Boston, 1736).—See Sparks's "American Biography," 2d series, vol. iii.

MASON. I. John Mitchell, an American clergyman, born in New York, March 19, 1770, died there, Dec. 26, 1829. His father was of Scotch birth, and pastor of an Associate Reformed church in New York. He graduated at Columbia college in 1789, and entered in 1791 the university of Edinburgh, but was recalled in 1792 by intelligence of his father's death, and succeeded to his pastoral charge in 1793. He published a pamphlet consisting of "Letters" on frequent communion, which induced the Associate Reformed churches to relinquish their former practice of celebrating the communion but once or twice a year. He projected the plan of a theological seminary which was established in New York in 1804, and was appointed its first professor of theology. In 1806 he projected the "Christian's Magazine," which he conducted for several years. In 1810 he resigned his pastoral charge with the purpose of forming a new congregation. Dr. Mason having established more intimate relations with a Presbyterian church than were believed to be authorized by the constitution of his own denomination, the matter was brought before the synod in Philadelphia in 1811, and was the occasion of his "Plea for Sacramental Communion on Catholic Principles" (1816). He accepted in 1811 the office of provost of Columbia college, which he resigned in 1816. In 1817 he resumed his pastoral charge. In 1821 he became president of Dickinson college, which office he relinquished in 1824 and return-

ed to New York. In 1822 he had transferred his connection from the Associate Reformed to the Presbyterian church. A collection of his works was edited by his son, the Rev. Ebenezer Mason (4 vols., New York, 1832). **II. Erskine**, an American clergyman, son of the preceding, born in New York, April 16, 1805, died there, May 14, 1851. He graduated at Dickinson college in 1823, and became pastor of a Presbyterian church at Schenectady in 1827, and of the Bleecker street church in New York in 1830. From 1836 to 1842 he was professor of ecclesiastical history in the Union theological seminary, New York. He published several occasional sermons, and a collection of his discourses appeared after his death, under the title of "A Pastor's Legacy," with a sketch of his life by the Rev. William Adams, D. D. (New York, 1853).

MASON, Lowell, an American composer, born in Medfield, Mass., Jan. 8, 1792, died in Orange, N. J., Aug. 11, 1872. From childhood he manifested great fondness for music, and at a very early age he began teaching it. In 1812 he removed to Savannah, Ga., where he gave instruction and led choirs and musical associations. In 1821 his "Boston Handel and Haydn Collection of Church Music" was published; and its success led him to remove to Boston, where in 1827 he commenced the instruction of classes in vocal music. About 1828 he became a champion of the Pestalozzian method of teaching music. Juvenile classes were now established and taught gratuitously by Mr. Mason, who was soon compelled by the extent of his labors to associate Mr. G. J. Webb with him. He published 15 or 16 juvenile collections of music, 7 or 8 glee books, mostly in connection with Mr. Webb, and more than 20 sacred and church music books. His latest work, "The Song Garden," appeared in 1866. In all these books are many pieces of his own composition, and many more adapted by him from the compositions of other authors. In conjunction with Professors Park and Phelps, he compiled a "Collection of Psalms and Hymns for Public Worship" (New York, 1858).

MASON, William, an English poet, born in Hull in 1725, died in York in April, 1797. He was the son of a clergyman, graduated at the university of Cambridge in 1745, and became a fellow in 1747. Having taken orders, he became rector of Asten in Yorkshire, and chaplain to the king. He was opposed to the American war and a member of the Yorkshire association for obtaining a reform of parliament; but the horrors of the French revolution are said to have changed his opinions. He was for years precentor and resident canon of York. His principal works are: "Caractacus" (London, 1759), and "Elfrida" (1752), dramatic poems; "The English Garden," a descriptive poem (1755); and "Essays on English Church Music" (York, 1795). He was an intimate associate of Gray, and published an edition of his poems with a memoir. A com-

plete edition of Mason's poems was published in York in 1771.

MASON AND DIXON'S LINE, the parallel of lat. 39° 43' 26.3" N., which separates Pennsylvania from Maryland, drawn by Charles Mason and Jeremiah Dixon, two distinguished English mathematicians and astronomers. As the northern limit (with the exception of small portions of Delaware and Virginia) of the original slave states, it was prominently mentioned in the controversies concerning slavery. It begins at the N. E. corner of Maryland, and runs due W. The years from 1681 to 1768 were marked with constant dissension and conflict between the rival proprietaries of Pennsylvania and Maryland and their partisans, on the subject of their common boundary; and the vicinity of this line was the theatre of riot, invasion, and bloodshed. Mason and Dixon arrived in Philadelphia on Nov. 15, 1763, and commenced their work in December, which was continued to a point 244 m. from the Delaware river, and within 36 m. of the whole distance to be run, where they were compelled to suspend operations in consequence of opposition by the Indians. They returned to Philadelphia, and were discharged on Dec. 26, 1767. At the end of every fifth mile a stone was planted, graven with the arms of the Penn family on one side, and of Lord Baltimore on the other. The intermediate miles were marked with smaller stones having a P on one side and an M on the other. The stones were all sent from England. In November, 1782, Col. Alexander McClean of Pennsylvania and Joseph Neville of Virginia ran the remaining part of the line, which was tested and corrected by astronomical observations, and permanently marked, in 1784. In 1849 the former surveys were revised, and found correct in all important points.

MASORA. See BIBLE, vol. ii., p. 610.

MASOVIA, or **Mazovia**, during the earlier centuries of independent Poland, a duchy or principality on both sides of the middle Vistula, inhabited by the Mazurs, a Polish tribe. In the Russian kingdom of Poland as established in 1815, it formed a palatinate with Warsaw as its capital. It is now mainly embraced in the government of Warsaw.

MASQUE, a species of dramatic entertainment, comprehending scenic effects and dancing. It was much cultivated in Europe during the 16th and 17th centuries, and reached its highest perfection in England in the reign of James I. Originating in the pageants, shows, and religious processions of the middle ages, the actors in which wore masks, and in the early miracle and moral plays, it gradually became a recognized form of the spoken drama, and the only one in which females, generally ladies of rank, took part. In the reign of James I. Ben Jonson and the leading dramatic authors, with the exception of Shakespeare, wrote masques for the court. Milton's "Comus" and "Arcades" are exquisite speci-

mens. The genius of Inigo Jones was for several years employed exclusively upon the decorations and elaborate machinery of the court masques, and Henry Lawes furnished the music for several of them. The queens of James I. and Charles I., with the chief nobility of the court, participated in these entertainments, the preparation of which frequently occupied many months, and cost immense sums. With the death of Ben Jonson, who may be regarded as the chief writer of masques, the taste for them died away.

MASS (Lat. *missa*, from *mittere*, to dismiss), in the Roman Catholic church, the form of celebrating the Lord's supper. When first introduced, the term denoted the dismissal of the catechumens and penitents, who were permitted to be present at the introductory, but not at the sacramental service, before the beginning of which they were called upon to leave the church. The two parts of the service were then distinguished as *missa catechumenorum* and *missa fidelium*. The oldest writing in which we find the term *missa* is a letter of St. Ambrose, and very soon after his time it passed into general use. According to the definition of Roman Catholic theologians, the mass is the true sacrifice of the new law—an offering instituted by Christ, in which, by the consecration and consumption of his body and blood under the form of bread and wine, Christ himself is mystically slain and offered as a victim to God the Father in recognition of his sovereign dominion. The Catholic church believes that by the words of consecration, pronounced by the priest over the bread and the wine, these elements are changed into the body and blood of Christ. The sacrifice of the mass is not considered to be substantially different from the sacrifice offered by Christ on the cross, but a repetition of it, Christ offering himself again through the hands of the priest. Through it the merits of Christ are believed to be available to men. It is called a propitiatory sacrifice, as Christ is believed to be really present as a victim, asking pardon for sinners as he did on the cross. The Roman Catholic church therefore sometimes offers masses specially for the dead, whom she mentions indeed in every mass. As she believes that Christians who leave this world without having sufficiently expiated their sins are obliged to suffer a temporary penalty in the other, she prays God, through Jesus Christ, for the remission of this penalty. The mass is called a eucharistic sacrifice, because it is believed that by offering Christ the church expresses gratitude to God in the best possible manner; and an impetratory sacrifice, because she hopes that God, touched by this offering, will grant new mercies.—In the first centuries bishops when celebrating mass were attended by other bishops or by priests, who offered, consecrated, and communicated with them. This was termed *concelebrare* and *consacraré*. This custom prevailed in both the Greek and Latin churches;

and in the latter it is still usual for priests on the day of their ordination to celebrate with the ordaining bishop. In the Lyonnese rite, which has very recently been abolished, a number of priests thus officiated with the bishop at solemn pontifical mass. It was also a rule in the early church, when bishops visited each other, that they should unite in celebrating as a sign of their being of the same communion.—In a liturgical point of view, the mass is divided into five parts: 1, the preparatory part, formerly called the mass of the catechumens; 2, the offering, which extends from the offertory to the canon; 3, the canon, including the consecration; 4, the breaking of the host and the communion; 5, the thanksgiving or post-communion. In these parts the liturgies of all the eastern or western churches, except in the Protestant communions, substantially agree (see **LITURGY**), as well as in prescribing the breaking of the bread, in conformity with the words of the Scriptures, which say that Christ broke the bread. In the beginning, as Justin Martyr testifies in his second apology, the Lord's supper was only celebrated on the Lord's day; but, according to Pellicia, the western Christians began in the 2d century to celebrate it on Fridays and Wednesdays as well, and in the East during the 4th century it became customary to celebrate on Saturdays. St. Augustine says that a great diversity existed about this in his time; it was then the rule to offer the sacrifice daily in the churches of Africa, Spain, and Constantinople, and this rule was made universal in the 6th century. At this epoch the Latin church allowed bishops and priests, wherever there existed insufficiency of church room, to celebrate twice on certain great festivals, as on the feast of the Circumcision, Jan. 1. In some places this was done thrice and even four times. On Holy Thursday, every priest was allowed to celebrate thrice, and twice daily during the whole of Easter week. In the 8th century at Rome the privilege of triple celebration was also attached to June 29, the feast of St. Peter and St. Paul. At present the privilege of saying three masses on the same day is restricted in the Roman Catholic church to Christmas. In Spain the privilege is enjoyed by priests on All Souls' day, Nov. 2. In missionary countries, where there is a scarcity of clergymen, each priest is permitted, by a special indulgent from Rome, to say mass twice on Sundays and holidays of obligation. In modern times it has been often proposed in the church to celebrate the mass more rarely, and only when a large attendance of the people is to be expected. But the council of Trent confirmed the practice of saying private masses, and recommended a daily celebration. The presence of one who recites the responses is required at private mass. The liturgy of the mass still indicates that in former times all the people who were present communed with the priests. This usage gradually ceased, and the priest was

often left to commune alone. Still, in populous parishes in most Roman Catholic countries, communion is distributed at most private masses, and the utility of frequent communion is sedulously inculcated.—With respect to the language used in the celebration of mass, the western churches use the Latin, and the Roman missal. (See LITURGY, and MISSAL.) The eastern churches in union with that of Rome use the ancient idioms of their respective peoples, and are not allowed to celebrate in Latin. The wishes sometimes expressed by larger or smaller bodies of the Catholic church to translate the liturgy of the mass into the modern languages, and to let the responses at the mass be recited or sung by the entire congregation, have never been favored by the highest ecclesiastical authorities, though in some cases it has been permitted as a privilege, as for instance to the duke Eugene of Würtemberg, who in 1786 received from Pius VI. permission to introduce the German mass into his court chapel.—There are different kinds of masses. A high or solemn mass is celebrated with the assistance of a deacon and subdeacon, and is sung by choristers; but the principal mass on Sundays and festivals, in which part of the service is sung by the priest without deacon or subdeacon, is usually called in this country high mass. A low mass is one of which no part is sung, and at which the priest has no assistant but his clerk. The ordinary duration of a low mass is half an hour. The mass of the presanctified (*missa præsanctificatorum*) is the name given to the service celebrated in the Latin church on Good Friday, and in the orthodox Greek church on nearly all the week days in Lent. It consists in the consumption by the priest of the bread consecrated on a previous day; and is, properly speaking, not a mass at all; the consecration being an essential part of the sacrifice. At all masses the priest wears vestments which indicate by their color the ecclesiastical season of the year or the stated festival which is celebrated. Thus red is used for the feast of martyrs, white for those of virgins, purple for the penitential seasons of Lent, Advent, and vigils. At the masses for the dead black vestments are used, some psalms and ceremonies omitted, and the people are dismissed without the benediction.—Masses may be said for any special purpose (votive masses), as for the recovery of health, for the avoiding of danger, for obtaining a special favor, &c. In the middle ages some practices crept in which the church condemned, as the celebration of the mass without the assistance of a clerk, the combination of several masses in one in order to get a greater payment, &c. The "Congregation of Rites," instituted by Sixtus V. in 1587, watches over the purity of the ritual. The Greek church and the other eastern churches hold, in the main, the same views with regard to the mass as the Roman Catholic church. The difference is mostly limited to ceremonies.—Every mem-

ber of the Catholic church is bound, under pain of mortal sin, by one of the "precepts of the church," unless prevented by sickness or other grave impediment, to attend mass every Sunday and on certain holidays called days of obligation.

MASSA, a town of Italy, capital of the province of Massa e Carrara, on the Frigido, 35 m. N. N. W. of Leghorn; pop. about 5,000. It has a lyceum, a gymnasium, a beautiful castle, and important silk manufactories.

MASSA E CARRARA, a central province of Italy, in Tuscany, embracing the former duchy of Massa-Carrara; area, 680 sq. m.; pop. in 1871, 161,944. The principal rivers flowing through it are the Serchio and the Magra. Branches of the Apennines conjointly with the Apuan Alps traverse the entire province. The most important product is the marble of Carrara. Wine and olives are cultivated. It is divided into the districts of Massa, Carrara, Pontremoli, and Castelnovo. Capital, Massa. The former duchy was before 1741 the possession of the house of Cibo-Malaspina, and subsequently, through the marriage of the daughter of the last duke, a possession of the Estes of Modena, together with which it was occupied by the French in 1796. After various changes it was reunited with Modena in 1829, and annexed to the dominions of Victor Emanuel in 1860.

MASSAC, a S. county of Illinois, bordering on the Ohio; area, 240 sq. m.; pop. in 1870, 9,581. The surface is diversified and heavily timbered, and the soil fertile. It contains coal and lead. The chief productions in 1870 were 72,316 bushels of wheat, 133,126 of Indian corn, 22,097 of oats, 13,125 of potatoes, 67,560 lbs. of tobacco, 42,505 of butter, and 2,034 tons of hay. There were 762 horses, 948 milch cows, 1,263 other cattle, 2,297 sheep, and 5,424 swine; 1 manufactory of wagon materials, 1 of tobacco and snuff, 4 saw mills, and 5 flour mills. Capital, Metropolis.

MASSACHUSETTS, one of the thirteen original states of the American Union, and one of the New England states, between lat. 41° 15' and 42° 53' N., and lon. 69° 56' and 73° 32' W.; extreme length N. E. and S. W., 160 m.; breadth from 47 to about 90 m.; estimated area, 7,800 sq. m. It is bounded N. by Vermont and New Hampshire, E. by the Atlantic ocean, S. by the Atlantic, Rhode Island, and Connecticut, and W. by New York. It is divided into 14 counties, viz.: Barnstable, Berkshire, Bristol, Dukes, Essex, Franklin, Hampden, Hampshire, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, and Worcester. Boston, the commercial centre and the largest city of New England, is the capital; in 1870 it contained 250,526 inhabitants, but by the annexation of Charlestown, Brighton, and West Roxbury, in 1873, its population was, according to assessors' returns, increased to about 360,000 in 1874. The other cities are Cambridge, which in 1870 had 39,634 inhabitants; Chelsea, 18,547;

Fall River, 26,766; Fitchburg, 11,260; Gloucester, 15,389; Haverhill, 13,092; Holyoke, 10,733; Lawrence, 28,921; Lowell, 40,928; Lynn, 28,233; New Bedford, 21,320; Newburyport, 12,595; Newton, 12,825; Salem, 24,117; Somerville, 14,685; Springfield, 26,703; Taunton, 18,629; and Worcester, 41,105. The population and rank of the state in the Union, according to the national census, have been:

YEARS.	White.	Colored.	Total.	Rank.
1790.....	873,324	5,463	878,787	4
1800.....	416,398	6,452	422,845	5
1810.....	465,308	6,137	471,445	5
1820.....	516,419	6,140	522,559	7
1830.....	608,859	7,049	615,908	8
1840.....	729,080	8,669	737,749	8
1850.....	955,450	9,064	964,514	6
1860.....	1,221,432	9,602	1,231,034	7
1870.....	1,443,156	13,947	1,457,103	7

Included in the total population of 1860 were 32 Indians, and in that of 1870 87 Chinese, 10 Japanese, and 151 Indians. Of the whole number of inhabitants in 1870, 703,779 were



State Seal of Massachusetts.

males and 753,572 females; 1,104,032 were native and 353,319 foreign born. Of the natives, 17,313 were born in Connecticut, 55,571 in Maine, 903,297 in Massachusetts, 47,773 in New Hampshire, 24,628 in New York, 14,356 in Rhode Island, and 22,110 in Vermont; 243,784 persons born in Massachusetts were living in other states. Of the foreign born, 65,055 were natives of British America, 13,072 of Germany, 34,099 of England, 216,120 of Ireland, and 9,003 of Scotland. The average density of population was 136.84 persons to a square mile, being greater than that of any other state. There were 305,534 families, with an average of 4.77 persons to each, and 236,473 dwellings, with an average of 6.16 persons to each. The increase of population from 1860 to 1870 was 18.15 per cent. The number of male citizens 21 years old and upward was 312,770. There were 74,935 persons 10 years of age and over unable to read, and 97,742 who could not write, of whom 89,830 were foreign born;

31,746 of the male adult population, or 7.97 per cent., and 53,940, or 12.27 per cent., of the female adults, were illiterate. The number of paupers supported during the year ending June 1, 1870, was 8,036, at a cost of \$1,121,604; of the number (5,777) receiving support June 1, 1870, 5,396 were natives and 381 foreigners. There were 1,593 persons convicted of crime during the year; of the number (2,526) in prison June 1, 1870, 1,291 were of native and 1,235 of foreign birth. The state contained 761 blind, 538 deaf and dumb, 2,662 insane, and 778 idiotic. Of the total population 10 years of age and over (1,160,666), there were engaged in all occupations 579,844 persons; in agriculture 72,810, of whom 31,019 were laborers and 39,766 farmers and planters; in professional and personal services 131,291, including 2,040 clergymen, 45,770 domestic servants, 279 journalists, 50,564 laborers not specified, 1,270 lawyers, 2,047 physicians and surgeons, 7,220 teachers not specified, 847 teachers of music, and 506 professional musicians; in trade and transportation, 83,078; in manufactures, mechanical and mining industries, 292,665, of whom 5,774 were blacksmiths, 1,102 bookbinders, 48,255 boot and shoe makers, 23,506 carpenters and joiners, 39,195 cotton mill operatives, besides 4,629 mill and factory operatives not specified, 5,311 fishermen and oystermen, 8,273 machinists, 7,887 painters and varnishers, 16,787 tailors and seamstresses, besides 7,649 milliners and dress and mantua makers, and 19,863 woollen mill operatives. The total number of deaths during the year was 25,859, being 1.77 per cent. of the entire population. Chief among the causes of mortality were consumption, from which 5,157 persons died, and pneumonia, 1,696; the number of deaths from all causes to 1 from consumption being 5, and 15.2 to 1 from pneumonia. There were 1,685 deaths from cholera infantum, 1,142 from enteric fever, 911 from scarlet fever, 280 from diphtheria, and 1,114 from diarrhœa, dysentery, and enteritis.—From the west for about 100 m. Massachusetts has the regular form of a parallelogram about 50 m. wide; thence it spreads out N. E. and S. E. on two sides of Massachusetts bay, terminating S. E. in the long peninsula of Cape Cod, which, describing to the north and slightly to the west a segment of a circle, encloses Cape Cod bay. It also includes several islands, of which Martha's Vineyard and Nantucket are the largest. Besides the two mentioned, there are Buzzard's bay on the S. coast, 30 m. long, with an average width of 7 m., and Plymouth bay, a small inlet communicating on the east with Cape Cod bay. The Elizabeth islands are a group of 16 off Cape Cod. (See ELIZABETH ISLANDS.) The state has many excellent harbors, the best of which are at Boston and New Bedford. No large and navigable rivers, excepting the Merrimack, find their outlet on the coast. The Housatonic river, which rises in the W. part of the state, and the Connecti-

cut, flow S. through Connecticut into Long Island sound; the Merrimack, which is navigable for sloops to Haverhill, 18 m. from its mouth, flows through the N. E. corner, and supplies immense water power to Lowell, Lawrence, and other manufacturing centres. The falls in the Connecticut afford valuable water power. The other principal streams are the Nashua, Taunton, Concord, Blackstone, and Charles. It contains several small lakes.—The surface of the state is greatly diversified. The extreme west is mountainous, having two ranges of the Green mountains, the Taghkannic or Taconic and Hoosac ridges, which run nearly parallel to each other and into Connecticut. Saddle mountain in the N. W. corner is 3,600 ft. high, and Mt. Washington in the S. W. corner 2,624 ft. Further E. is the beautiful and fertile valley of the Connecticut. In this section are several elevations, detached members of the White mountain system, the highest peaks of which are Mt. Tom (about 1,800 ft.) on the W., and Mt. Holyoke (1,120 ft.) near Northampton, on the E. bank of the Connecticut river, and Wachusett mountain (2,018 ft.) N. of the middle of the state. The east and northeast are hilly and broken, and the southeast generally low and sandy.—Massachusetts is eminently a region of metamorphic rocks. Those in the E. part of the state especially are largely overspread with the sands, gravel, and boulders of the drift formation; and the long point of land making the S. E. extremity of the state (see CAPE COD) is so covered with these loose materials, that the rocky beds beneath are entirely concealed. Syenite and granite prevail along the coast, and extensive quarries of these rocks are worked at Quincy, Cape Ann, and other points. Around Boston is a formation of coarse conglomerates and argillaceous slates of obscure age on account of the metamorphic action to which they have been subjected. At Braintree, near Quincy, the slates contain trilobites, but generally no fossils have been met with in these rocks. The fossils would seem to refer the slates to the lower Silurian period. These obscure formations are traced in an irregular belt toward Providence, and near the Rhode Island line they are connected with coal-bearing strata, referable, it is supposed, to the true carboniferous epoch. In many localities in Bristol and Plymouth counties these strata contain beds of anthracite, some of which, as at Mansfield, have been worked for many years; but they are of little or no value, the coal always being much crushed, and the beds very irregular in their production. Gneiss and talcose and mica slates in broad belts traverse the state from N. to S. from the E. portion to the waters of the Housatonic in Berkshire. Among these rocks are interspersed a few beds of metamorphic limestone, but no minerals or ores of value. Along the Connecticut river valley, in the triassic or new red sandstone formation, known as the Connecticut valley

area, are found very extensive fossil footprints, which from their resemblance to the feet of birds are first called *ornithichnites*; but they have since been found by Prof. Edward Hitchcock, who gave the name, to be not only the tracks of birds but of other animals. Some of them indicate that they were made by animals of gigantic size. (See FOSSIL FOOTPRINTS.) Trap rocks are associated with it, and near the contact of the sandstone and trap, or of the sandstone and the gneiss, are found veins of metallic ores, as of lead, copper, and zinc, none of which, however, have repaid the money spent in their exploration. The principal localities of these ores are at Southampton, Leverett, Montague, Whately, and a few other towns. The high lands which traverse the state from N. to S., dividing the waters that flow into the Connecticut from those of the Housatonic, and called the Hoosac mountains, are chiefly of gneiss and mica slate. In Middlefield a belt of talcose slate, continued further N. in the mica slate region, reaches the gneiss; and here are developed in near proximity beds of limestone, steatite, and serpentine. The towns along the Housatonic and on the same range extending to the N. border of the state are in the region of the altered Silurian sandstones and calcareous formations. This is the most important mineral district of the state, numerous beds of iron ore having been worked for many years, and the quartz rocks affording in their disintegrated beds bodies of glass sand of unusual purity. In 1874 deposits specially rich in silver, and containing also lead and gold, were discovered in Essex co., near Newburyport, where mining operations have been begun.—In the valleys, particularly of the Housatonic and Connecticut, the soil is rich and productive, but a large portion of the more elevated lands and the long sandy coast do not repay the husbandman. The climate near the coast is very variable, with prevailing E. winds, especially in spring. The mean annual temperature is about 48°; spring, 43°; summer, 71°; autumn, 51°; winter, 21°. The annual rainfall is about 55 inches. In the interior it is more equable, and in the mountainous districts very severe in winter.—Of the total area of the state, somewhat less than one half is improved. According to the census of 1870, there were 26,500 farms, of which 1,129 contained between 3 and 10 acres each, 2,532 between 10 and 20, 8,381 between 20 and 50, 8,727 between 50 and 100, 5,643 between 100 and 500, and 40 between 500 and 1,000. The number of acres of improved land on farms was 1,736,221; woodland, 706,714; other unimproved, 287,348. The cash value of farms was \$116,432,784; of farming implements and machinery, \$5,000,879; total amount of wages paid during the year, including value of board, \$5,821,032; total estimated value of all farm productions, including betterments and additions to stock, \$32,192,378; of or-

chard products, \$939,854; of produce of market gardens, \$1,980,321; of forest products, \$1,616,818; of home manufactures, \$79,378; of animals slaughtered or sold for slaughter, \$4,324,658; of all live stock on farms, \$17,049,228. The chief productions were, 17,574 bushels of spring and 17,074 of winter wheat, 239,227 of rye, 1,397,807 of Indian corn, 797,664 of oats, 133,071 of barley, 58,049 of buckwheat, 24,690 of peas and beans, 3,026,363 of potatoes, 597,455 tons of hay, 7,312,885 lbs. of tobacco, 306,659 of wool, 6,559,161 of butter, 2,245,873 of cheese, 61,910 of hops, 399,800 of maple sugar, 25,299 of honey, and 15,284,057 gallons of milk sold. Besides 45,227 horses and 52,263 neat cattle not on farms, there were 41,039 horses, 114,771 milch cows, 24,430 working oxen, 78,851 other cattle, 78,560 sheep, and 49,178 swine.—As a manufacturing state, Massachusetts ranks with the first in the Union. The amount of capital invested in manufactures, and the value of the annual products, are greater in New York and Pennsylvania; but in proportion to the population the industries of Massachusetts are more extensive than those of either of the states named. In 1850 the capital invested in manufactures amounted to \$88,940,292, and the annual products to \$157,743,994; in 1860 the former had increased to \$132,792,327 and the latter to \$255,545,922. In 1870 the amount of capital invested was \$231,677,862, and the value of annual products \$553,912,568; the materials used were valued at \$334,413,982, while the wages paid amounted to \$118,051,886. There were 13,212 establishments using 2,396 steam engines of 78,502 horse power and 3,157 water wheels of 105,854 horse power, and employing 279,380 hands, of whom 179,032 were males above 16, 86,229 females above 15, and 14,119 youth. The aldermen and selectmen of the various cities and towns are required by law to ascertain and return decennially to the state secretary the industrial statistics of the commonwealth. The value of the products of all industries as thus returned amounted to \$124,000,000 in 1845, \$295,000,000 in 1855, and \$577,000,000 in 1865; showing an increase during the last named decade in the value of industrial products of 72 per cent., while the population during the same period increased only 3 per cent. The leading products returned for the year ending May 1, 1865, were:

PRODUCTS.	Value.	Capital.	Hands.
Boots and shoes.....	\$52,915,243	\$10,067,474	55,160
Calico and delaine.....	25,258,708	4,222,000	4,208
Clothing.....	17,748,894	4,694,440	24,722
Cotton.....	54,439,881	83,298,956	23,678
Hay.....	18,195,274	.....	.....
Horses, oxen, and cows.....	19,154,790	.....	.....
Mackerel and cod fishery.....	4,582,213	3,757,761	11,513
Paper.....	9,905,321	3,735,300	3,554
Printing and newspapers.....	5,355,143	1,919,400	2,409
Rolled and slit iron and nails.....	8,836,502	2,827,300	3,194
Tanning and currying.....	15,821,712	4,994,983	3,847
Whale fishery.....	6,618,670	5,379,862	3,496
Woollen goods.....	48,430,671	14,785,580	18,433

In the manufacture of boots and shoes, cordage and twine, cotton goods, cutlery, chairs, lasts, straw goods, and woollen goods, as well as textiles in general, and bleaching and dyeing, Massachusetts ranks above all other states. The extent of these industries in this state, as compared with the United States, in 1870, is indicated in the following statement:

INDUSTRIES.	MASSACHUSETTS.		UNITED STATES.	
	Capital.	Products.	Capital.	Products.
Bleaching and dyeing.....	\$1,063,650	\$22,252,000	\$5,006,950	\$55,571,493
Boot and shoe findings.....	872,030	2,161,481	853,560	8,880,091
Boots and shoes.....	19,559,738	63,899,538	43,994,366	181,644,090
Cordage.....	666,900	2,886,848	9,380,470	9,979,382
Cotton goods.....	42,153,175	50,493,153	189,538,797	177,459,739
Cutlery.....	1,185,400	1,617,904	2,243,830	2,852,803
Chairs.....	2,636,650	8,971,522	7,643,884	10,567,104
Lasts.....	146,000	318,765	830,300	665,708
Paper.....	7,723,628	12,696,491	35,780,514	50,842,445
Sails.....	111,400	503,885	583,290	2,255,446
Straw goods.....	1,361,400	4,869,514	2,119,350	7,282,056
Textiles, including cotton goods, flax and linen goods, carpets, woollen goods, and worsted goods.....	72,543,475	112,763,211	265,084,095	380,913,515
Woollen goods.....	20,622,400	39,489,242	97,173,432	151,208,196

While Massachusetts holds the first rank in respect to the industries named, the state is specially noted for the extent of its manufactures of boots and shoes and cotton and woollen goods. Here are the great centres of these industries in the United States. Of the boot and shoe establishments, 1,123 were each producing annually more than \$5,000. In these were employed 7,042 sewing and 636 pegging machines and 51,167 hands. The products embraced 10,129,910 pairs of boots and 29,164,594 pairs of shoes. Nearly one third of the capital invested in the manufacture of cotton goods in the United States was employed in Massachusetts. The machines in use embraced 55,343 looms and 1,255,552 frame and 1,363,989 mule spindles. The cotton consumed amounted to 130,654,040 lbs.; the products included 22,123,147 yards of sheetings, shirtings, and twilled goods, 12,434,858 of lawns and fine muslins, 229,613,105 of print cloths, 2,108,952 lbs. of yarn not woven, 2,595,358 dozens of spool thread, 33,712,996 yards of warps, 3,773,664 lbs. of bats, wicking, and wadding, 6,864,954 yards of flannel, 13,690,000 of gingham and checks, and 407,527 lbs. of thread. The value of all products increased from \$21,394,401 in 1850 to \$38,004,255 in 1860, and \$59,493,153 in 1870. In the woollen mills were 1,367 cards, with a daily capacity for 159,484 lbs. of carded wool, 4,469 broad and 3,374 narrow looms, and 470,785 spindles; 37,146,190 lbs. of domestic wool were consumed, besides 2,813,449 of cotton and 5,994,110 of shoddy. The products embraced 403,785 pairs of blankets, 21,819,879 yards of cloths, cassimeres, and doeskins, 285,000 of

felted cloth, 22,321,684 of flannels, 7,701,880 of satinets, 585,435 shawls, 808,920 yards of tweeds and twills, and 1,235,161 lbs. of yarn.

The leading industries of the state, as reported by the census of 1870, are shown in the following table:

INDUSTRIES.	No. of establishments.	Steam engines, horse power.	Water wheels, horse power.	Hands employed.	Capital.	Wages.	Value of materials.	Value of products.
Agricultural implements.....	37	221	964	477	\$499,400	\$243,112	\$487,460	\$1,038,500
Blacksmithing.....	651	57	109	1,552	715,067	650,058	565,537	1,932,443
Bleaching and dyeing.....	32	1,753	187	1,387	1,063,530	608,343	20,623,653	22,252,429
Bookbinding.....	65	94	.....	1,075	492,300	473,810	588,070	1,446,073
Boots and shoe findings.....	170	190	6	1,612	372,080	450,858	1,204,420	2,161,431
Boots and shoes.....	2,392	2,266	94	54,381	19,559,735	27,205,253	61,868,406	88,399,553
Bread, crackers, and other bakery products	144	220	.....	1,087	758,650	552,215	2,128,676	3,130,172
Brick.....	107	823	44	2,901	2,435,810	763,168	978,508	12,423,789
Carpentering and building.....	901	468	112	5,825	1,880,202	8,484,104	6,808,115	4,457,525
Carpets, other than rag.....	6	303	100	2,200	3,250,000	892,954	3,256,628	4,457,525
Carriages and wagons.....	826	119	151	2,914	1,729,091	1,486,959	1,826,965	4,083,656
Cars, freight and passenger.....	6	280	.....	866	1,245,000	636,760	1,486,929	2,408,827
Clothing, men's.....	446	82	.....	9,578	5,096,764	8,815,742	11,913,817	20,212,407
" women's.....	116	.....	.....	959	190,820	248,268	889,731	1,512,613
Cordage and twine.....	32	1,069	208	988	666,900	895,273	1,961,410	2,886,648
Cotton goods, not specified.....	159	16,700	80,398	41,446	42,148,175	12,912,528	35,462,617	56,257,580
" batting and wadding.....	7	90	120	125	96,500	47,228	802,585	384,080
" comfortables.....	1	5	.....	9	5,000	1,500	15,000	25,000
" thread, twine, and yarn.....	27	502	1,817	2,016	2,582,700	651,674	1,706,484	8,009,543
Cutlery.....	12	822	532	1,140	1,185,400	601,247	1,001,891	6,212,325
Drugs and chemicals.....	22	235	.....	8,998	4,287,571	2,291,370	351,238	1,617,904
Fisheries, exclusive of the whale fisheries..	257	.....	.....	834	1,290,500	190,545	1,152,750	1,506,399
Flouring and grist mill products.....	316	1,810	9,018	835	271,314	271,313	8,768,926	9,739,374
Furniture, not specified.....	243	1,275	675	4,044	8,372,225	2,243,980	3,146,828	7,397,626
" chairs.....	76	898	1,809	5,638	2,636,650	1,291,871	1,651,006	3,971,522
Glass, cut.....	8	21	.....	104	50,500	51,400	70,000	171,000
" ware.....	11	164	.....	1,570	1,208,000	669,520	531,634	1,571,000
" window.....	8	60	110	494	883,560	257,200	127,300	800,000
Hardware.....	119	591	703	1,757	1,908,050	929,738	891,665	2,515,429
Hats and caps.....	50	529	.....	8,290	855,600	985,304	1,546,566	3,416,191
Hoop skirts and corsets.....	13	21	.....	664	197,300	170,561	349,225	710,772
Hosiery.....	32	408	718	2,415	1,570,500	848,564	1,515,326	8,213,451
India rubber and elastic goods.....	16	698	255	1,405	1,920,600	580,728	1,564,006	3,183,218
Iron, forged and rolled.....	29	5,463	715	2,530	2,760,125	1,827,675	4,638,686	6,699,907
" nails and spikes, cut and wrought.....	49	1,767	1,450	2,458	2,000,550	1,059,230	4,082,775	5,986,144
" pipe, wrought.....	5	290	23	335	385,000	210,540	973,218	1,407,000
" castings not specified.....	101	955	650	2,749	2,496,900	1,640,402	2,574,320	5,265,154
" stoves and hollow ware.....	18	815	114	965	940,500	646,401	555,675	1,751,548
Jewelry, not specified.....	59	186	62	1,642	972,500	786,650	825,528	2,242,025
Lasts.....	20	226	12	208	146,000	189,960	68,617	318,768
Leather, tanned.....	138	1,584	478	1,424	3,130,580	756,467	8,025,573	9,984,497
" curried.....	196	1,350	85	8,194	3,163,076	1,812,052	14,969,920	19,211,380
" morocco, tanned and curried.....	40	299	16	744	998,900	450,300	2,815,800	3,158,020
Lumber, planed.....	67	2,143	218	1,156	1,686,600	753,381	3,783,501	8,155,870
" saved.....	638	2,019	13,900	2,258	2,031,879	558,055	2,023,458	8,496,320
Machinery, not specified.....	200	1,731	1,274	8,626	4,105,600	2,116,494	2,570,066	6,738,102
" cotton and woollen.....	95	828	572	2,816	2,940,750	1,673,917	2,238,392	4,821,314
" railroad repairing.....	3	205	.....	1,101	705,300	635,585	512,825	1,898,894
" steam engines and boilers.....	42	608	57	1,357	1,843,000	878,901	1,335,073	2,973,432
Marble and stone work.....	49	498	10	1,365	993,500	820,111	1,879,688	2,175,460
Molasses and sugar, refined.....	4	900	.....	490	2,000,000	226,348	6,944,305	7,065,435
Musical instruments, organs and materials.	17	124	.....	745	698,000	851,556	819,050	1,274,614
" pianos.....	21	320	23	994	2,075,711	949,138	675,759	2,581,565
Oil, fish.....	9	85	.....	152	482,000	57,138	1,970,232	2,575,176
" linseed.....	2	215	.....	69	200,000	47,500	914,000	1,008,610
Paper, not specified.....	17	188	1,177	864	558,100	144,903	555,139	1,052,754
" printing.....	25	364	3,544	1,178	1,858,700	549,190	3,052,971	4,319,924
" wrapping.....	28	410	1,543	416	914,500	181,752	769,769	1,289,178
" writing.....	30	170	3,054	2,062	4,387,823	979,000	8,688,470	6,025,595
Printing, cotton and woollen goods.....	11	1,806	1,165	2,996	2,804,053	1,110,055	15,420,530	17,325,150
Printing and publishing, not specified.....	18	64	.....	485	520,400	268,538	308,611	1,702,740
" book.....	8	60	.....	311	268,000	177,456	372,800	1,205,000
" newspaper.....	52	328	.....	1,185	2,540,400	991,580	1,493,585	4,005,425
" job.....	89	141	.....	1,092	1,684,650	513,916	420,544	1,477,511
Ship building, repairing, and ship materials	93	857	.....	1,160	1,192,350	727,473	902,845	2,070,301
Shovels and spades.....	5	470	390	654	371,100	376,000	1,080,144	1,820,526
Stone.....	58	189	.....	137	662,750	790,195	132,444	1,294,143
Straw goods.....	39	237	85	11,441	1,361,400	1,411,350	2,508,070	4,569,514
Tin, copper, and sheet-iron ware.....	300	84	.....	1,584	1,284,900	766,455	1,384,095	2,785,674
Upholstery.....	77	.....	.....	901	978,655	461,909	1,284,157	4,224,457
Watches.....	3	55	.....	758	980,000	610,024	175,909	1,281,160
Wire.....	6	1,100	343	910	1,415,500	555,837	1,288,822	2,354,672
Woollen goods.....	182	5,421	12,280	20,541	20,622,400	7,296,752	24,866,118	39,480,242
Worsted goods.....	35	730	2,579	5,275	2,339,500	1,673,462	5,663,048	8,280,541

Not included in the above statement for 1870 are the statistics of mining and quarrying, in which the capital invested amounted to \$944,250, and the annual products to \$1,493,522;

and those of fisheries, with \$4,287,871 capital and \$6,215,325 annual products. The stone quarried, including large quantities of Quincy granite, was valued at \$1,294,148.—For com-

mercial purposes, the state is divided into 11 customs districts, of which the ports of entry are given in the following statements. The imports and exports for the year ending June 30, 1874, were as follows:

PORTS OF ENTRY.	Imports.	Domestic exports.	Foreign exports.
Boston.....	\$52,212,405	\$28,885,627	\$2,275,028
Fall River.....	84,974	.....	.....
Gloucester.....	94,007	1,400	109
Marblehead.....	11,725	.....	.....
New Bedford.....	95,971	80,369	233
Newburyport.....	227,353	89,076	3,663
Plymouth.....	123	84	.....
Salem and Beverly..	60,717	49,009	1,744
Total.....	\$52,737,280	\$28,455,515	\$2,280,772

The movement of foreign shipping at the various ports, and the number of vessels registered, enrolled, and licensed, were as follows:

PORTS OF ENTRY.	ENTERED.		CLEARED.		REGISTER'D, &C.	
	No.	Tons.	No.	Tons.	No.	Tons.
Barnstable..	16	1,423	20	1,786	483	50,909
Boston.....	2,717	730,769	2,652	659,102	889	274,941
Edgartown..	.....	.....	.....	.....	16	1,135
Fall River..	16	1,956	4	575	147	27,291
Gloucester..	121	22,710	95	14,777	491	28,668
Marblehead..	83	8,011	33	4,254	62	2,636
Nantucket..	.....	.....	.....	.....	7	778
New Bedford	53	12,572	87	7,818	233	47,371
Newburypt.	19	2,580	34	7,837	67	12,865
Plymouth...	1	102	1	102	89	8,940
Salem and Beverly...	84	8,463	100	11,767	85	7,844
Total...	3,066	788,541	2,982	708,048	2,563	458,878

Those that entered and cleared as well as those registered were mostly sailing vessels. The number of vessels engaged in the coastwise trade was as follows:

PORTS OF ENTRY.	COASTWISE TRADE.			
	ENTERED.		CLEARED.	
	No.	Tons.	No.	Tons.
Barnstable.....	24	2,966	3	405
Boston.....	1,271	1,150,169	1,741	1,286,866
Edgartown.....	23	2,035	11	1,717
Fall River.....	456	886,647	330	813,006
Gloucester.....	70	9,567	36	8,896
Marblehead.....	10	1,123	7	773
Nantucket.....	7	892	8	147
New Bedford.....	135	47,360	86	8,785
Newburyport.....	523	59,738	491	65,756
Plymouth.....	8	516	1	122
Salem and Beverly.....	93	10,443	41	5,461
Total.....	2,655	2,167,886	2,700	2,191,829

Besides the above, 105 vessels of 3,677 tons engaged in the general fisheries entered at Newburyport, and 116 of 3,922 tons cleared. For more than a century the fisheries of Massachusetts have constituted one of its leading industries. (See FISHERIES.) The most important centres of this industry are Gloucester, which far surpasses any other port of the country in the magnitude of its cod and mackerel fisheries, and New Bedford, which is the leading market in the United States for the pro-

duce of the whale. The entire products of the American whale fisheries for the year ending June 30, 1874, amounted to \$2,291,896, including sperm oil valued at \$1,250,987, other whale oil \$775,919, and whalebone \$264,990. Nearly all of these were from Massachusetts, where were employed in the whale fisheries about 170 vessels belonging to Barnstable, Edgartown, New Bedford, and Salem and Beverly. Of the 2,099 vessels employed in the cod and mackerel fisheries in the United States, 1,026 of 49,578 tons belonged to Massachusetts. According to the census of 1870, more than half of the products of fisheries in the United States, exclusive of the whale fisheries, were the result of Massachusetts industry. The capital invested in this business was \$4,287,871, and the number of persons employed was 8,993. Among the products, which were valued at \$6,215,325, were 451,125 quintals of cod, 1,651 tons of halibut, 188,567 barrels of mackerel, \$486,596 worth of miscellaneous fish, and 305,049 gallons of oil, valued at \$302,790. Ship building is carried on in most of the customs districts; in 1874 there were 77 vessels built, of 31,499 tons, including 5 steamers, of 689 tons. About two thirds of these were built in Boston, Charlestown, and Newburyport.—The first railroad in Massachusetts was opened for use in 1835, since which time an average of about 50 m. has been annually constructed. On Sept. 30, 1874, the entire mileage belonging to Massachusetts companies was 2,418, exclusive of 657 m. of sidings and 626 m. of double track; the length of main track and branches within the commonwealth was 1,782 m., and of double track and sidings 917 m. About 29 per cent. of the main lines are laid with steel rails. Nominally there are 60 corporations, but the railroads of the state are controlled by 31 distinct boards of direction. The average cost of roads has been \$56,883 62 a mile, in addition to the cost of equipment, \$7,701 a mile. The entire amount directly invested in the railroads reporting to the state is \$165,624,136, including \$117,066,798 of stock and \$48,557,338 of debt. The total earnings returned for the year amounted to \$34,632,483, of which about 49 per cent. were from passengers and 46 per cent. from freight. The number of passengers carried was 42,480,494. The whole number of accidents was 279, of which 127 resulted in death; nearly one third were caused by walking on the tracks. The average of casualties for a series of years from causes not attributable to the carelessness of the person injured has been 1 to each 1,400,000 passengers carried; but in 1874 it was only 1 to each 5,300,000. The railroads are under the general supervision of a board of three commissioners, who are appointed by the governor, and are required to report annually upon the condition of the roads and corporations, the causes of accidents, &c. The lines completed at the beginning of 1875 are represented in the following table, omitting those less than 5 m. long:

CORPORATIONS.	TERMINI.		LENGTH.		Capital stock paid in.	Cost of road, &c., proportion for Mass.
	From	To	Total.	In Mass.		
Berkshire.....	Sheffield.....	W. Stockbridge.....	22	22	\$600,000	\$606,000
Boston and Albany.....	Boston.....	Albany, N. Y.....	201	102	19,864,100	22,254,839
Branches. } Grand Junction.....	Cottage Farm.....	East Boston.....	6	9	.....	.....
} Milford.....	South Framingham.....	Milford.....	12	12	.....	.....
Boston, Barre, and Gardner.....	Worcester.....	Winchendon.....	86	36	868,901	1,291,688
Boston, Clinton, and Fitchburg.....	Fitchburg.....	South Framingham.....	41	41	872,600	2,535,564
Boston, Hartford, and Erie.....	Boston.....	Willimantic, Conn.....	85	51	20,000,000	8,275,861
Woonsocket division.....	Brookline.....	Woonsocket, R. I.....	38	32	.....	.....
Southbridge division.....	E. Thompson, Conn.....	Southbridge.....	17	10	.....	.....
Boston and Lowell.....	Boston.....	Lowell.....	26	26	8,200,000	5,654,775
Lexington and Arlington.....	Medford.....	Lexington.....	9	9	.....	.....
Boston and Maine.....	Boston.....	Portland, Me.....	116	36	6,921,274	8,815,604
Boston and Providence.....	Boston.....	Providence, R. I.....	44	38	4,000,000	4,634,060
West Roxbury.....	Forest Hills Station.....	Dedham.....	5	5	.....	.....
India Point.....	Seekonk.....	Providence, R. I.....	7	3	.....	.....
Cheshire.....	South Ashburnham.....	Bellows Falls, Vt.....	53	11	2,153,300	574,452
Connecticut River.....	Springfield.....	South Vernon, Vt.....	50	50	2,100,000	2,054,220
Danvers.....	Wakefield Junction.....	Danvers.....	9	9	.....	.....
Duxbury and Cohasset.....	Cohasset.....	Kingston.....	20	20	890,000	.....
Eastern.....	Boston.....	State line.....	41	41	4,997,600	14,192,653
Saugus.....	Revere.....	Lynn.....	9	9	.....	.....
Marblehead.....	Swampscott.....	Marblehead.....	4	4	.....	.....
Lawrence.....	Salem.....	Lawrence.....	19	19	.....	.....
Gloucester.....	Beverly.....	Gloucester.....	17	17	.....	.....
Essex.....	Wenham.....	Essex.....	5	5	.....	.....
South Reading.....	Peabody.....	Wakefield.....	8	8	.....	.....
Fall River, Warren, and Providence.....	Fall River.....	Providence, R. I.....	6	4	150,000	210,155
Fitchburg.....	Boston.....	Fitchburg.....	50	50	4,000,000	4,559,000
Watertown Branch.....	North Cambridge.....	Waltham.....	7	7	.....	.....
Lancaster, Sterling, and Marlboro.....	South Acton.....	Marlboro.....	12	12	.....	.....
Peterboro and Shirley.....	Ayer Junction.....	Mason Village, Vt.....	23	14	.....	.....
Framingham and Lowell.....	South Framingham.....	Lowell.....	26	10	511,706	1,826,996
Hanover Branch.....	North Abington.....	South Hanover.....	8	8	123,950	451,350
Holyoke and Westfield.....	Westfield.....	Holyoke.....	10	10	260,000	462,283
Hopkinton.....	Milford.....	Ashland.....	11	11	.....	.....
Lowell and Andover.....	Lowell.....	Ballardvale.....	9	9	487,250	886,680
Lowell and Lawrence.....	Lowell.....	Lawrence.....	12	12	200,000	368,153
Manchester and Lawrence.....	Manchester, N. H.....	Lawrence.....	26	4	1,000,000	.....
Mansfield and Framingham.....	South Framingham.....	Mansfield.....	21	21	801,550	850,974
Martha's Vineyard.....	Oak Bluffs.....	Katama.....	8	8	40,000	67,277
Middlesex Central.....	Lexington.....	Concord.....	8	8	.....	.....
Moundnock.....	Winchendon.....	Peterboro, N. H.....	16	2	197,864	49,881
Nashua, Acton, and Boston.....	North Acton.....	Nashua, N. H.....	20	15	262,000	581,992
Nashua and Lowell.....	Lowell.....	Nashua, N. H.....	14	9	800,000	764,974
New Bedford.....	New Bedford.....	Mansfield.....	32	32	1,678,500	2,250,750
Fairhaven.....	Fairhaven.....	Wareham.....	15	15	.....	.....
Taunton Junction.....	Taunton.....	Attleboro.....	8	8	.....	.....
Newburyport.....	Bradford.....	Newburyport.....	27	27	.....	.....
New Haven and Northampton.....	Georgetown.....	Danvers.....	84	.....	.....	.....
New London Northern.....	New Haven, Conn.....	Williamsburg.....	34	32	2,460,000	1,526,772
New York, New Haven, and Hartford.....	New London, Conn.....	Miller's Falls.....	100	44	1,500,000	895,692
Norwich and Worcester.....	New York, N. Y.....	Springfield.....	123	6	15,500,000	687,674
Old Colony.....	Worcester.....	Norwich, Conn.....	50	17	2,604,400	1,142,550
} Boston.....	Provincetown.....	Provincetown.....	.....	.....	.....	.....
} Plymouth.....	Plymouth.....	Plymouth.....	217	200	6,687,300	11,100,126
} Newport.....	Newport.....	Newport.....	.....	.....	.....	.....
Bridgewater.....	South Abington.....	Bridgewater.....	7	7	.....	.....
Middleboro and Taunton.....	Middleboro.....	Taunton.....	8	8	.....	.....
Woods' Hole.....	Cohasset Narrows.....	Woods' Hole.....	17	17	.....	.....
Hyannis.....	Yarmouth.....	Hyannis.....	5	5	.....	.....
Pittsfield and North Adams.....	Pittsfield.....	North Adams.....	19	19	450,000	450,000
Providence and Worcester.....	Providence, R. I.....	Worcester.....	43	25	2,000,000	1,558,604
Salem and Lowell.....	Tewksbury Junction.....	Peabody.....	17	17	248,805	481,468
South Shore.....	Brantree.....	Cohasset.....	11	11	259,865	626,592
Springfield, Athol, and Northeastern.....	Springfield.....	Athol.....	48	48	809,760	1,462,668
Stockbridge and Pittsfield.....	Stockbridge.....	Pittsfield.....	22	22	448,700	451,250
Stony Brook.....	North Chelmsford.....	Ayer.....	13	13	800,000	800,093
Troy and Greenfield.....	Greenfield.....	Hoosac Tunnel.....	30	30	.....	.....
Vermont and Massachusetts.....	North Adams.....	State line.....	7	7	.....	.....
Brattleboro.....	Fitchburg.....	Greenfield.....	56	56	2,860,000	3,807,941
Ware River.....	Miller's Falls.....	Brattleboro, Vt.....	21	11	.....	.....
Worcester and Nashua.....	Palmer.....	Winchendon.....	49	49	750,000	1,066,407
	Worcester.....	Nashua, N. H.....	46	39	1,789,700	2,109,629

The transportation facilities will be greatly improved by the completion in 1875 of the tunnel through the Hoosac mountain in the N. W. part of the state. This tunnel, which will have cost the state not less than \$14,000,000, including interest, is, next to the Mt. Ceniz tunnel, the longest in the world, being about 4½ m. in length. (See TUNNEL.) The 80 street railway corporations in the state have 210 m.

of track, including branches and sidings; their capital stock is \$5,588,125, exclusive of debt amounting to \$2,573,741; the average cost per mile of road and equipment was \$32,701; and the number of passengers carried in 1874 was 50,058,979.—The number of national banks in operation Nov. 1, 1874, was 220; paid-in capital, \$93,039,350; circulation outstanding, \$59,051,019; circulation per head, \$40 52;

ratio of circulation to wealth, 2.0 per cent.; to capital, 63.05 per cent. Fifty-one of these banks, with a capital of \$50,400,000, and an outstanding circulation of \$25,294,272, were in Boston. There were 179 savings banks, with 702,099 depositors, and deposits amounting to \$217,452,120. The average rate of dividends was $6\frac{1}{4}$ per cent. There were also 4 loan and trust companies, with \$1,700,000 capital, and deposits aggregating \$6,924,270. On Jan. 1, 1874, there were 127 fire and marine insurance companies transacting business in the state, with a paid-up capital of \$52,197,870 and net assets aggregating \$86,981,243. The premiums received on risks in 1873 aggregated \$84,017,278, while the paid losses amounted to \$61,524,120, showing a ratio of paid losses to premium receipts of 73.23.—The executive department of the government consists of a governor, whose annual salary is \$5,000; a lieutenant governor, who receives \$1,500 for attendance during the regular session of the legislature and \$10 a day for extra sessions; a secretary of the commonwealth, \$3,500; treasurer and receiver general, \$5,000; auditor, \$3,500; attorney general, \$5,000; and an executive council of eight, each of whom receives \$750 for the regular annual session of their board, \$5 a day for any subsequent session, and 20 cents a mile for travel. These officers are elected annually by the people. The legislative department consists of 40 senators and 240 representatives elected annually. Their pay is \$750 for the regular annual session, and 20 cents a mile for travel. The president of the senate and the speaker of the house of representatives receive each \$1,500 for the session. The judiciary comprises a supreme judicial court, consisting of a chief justice, salary \$6,500, and six justices, who receive \$6,000 per annum each. This has exclusive cognizance of all capital crimes, exclusive chancery jurisdiction so far as chancery powers are given by statute, and concurrent original jurisdiction of all civil cases where the amount in dispute exceeds \$4,000 in Suffolk, and \$1,000 in other counties. The superior court has criminal jurisdiction in all except capital cases, exclusive original jurisdiction of complaints for the flowing of land, and original jurisdiction of all civil actions except those confided to the supreme and police courts. Actions cannot be commenced in this court unless the debt or damages exceed \$20. The court has a chief justice, salary \$5,300, and nine justices, \$5,000 each. The legislature in 1858 united the courts of probate and the court of insolvency. For probate and insolvency purposes, frequent courts are held at different places by the judges in the several counties. A judge and a register of probate and insolvency are elected by the voters of each county. In the large cities there are municipal courts for civil and police purposes. All the judges are appointed by the governor for an unlimited time. The election for state officers and members of the legisla-

ture is held on the first Tuesday after the first Monday in November, and the legislature meets on the first Wednesday of January. Voters are required to be 21 years old, to have resided a year in the state and six months in the town, to pay a poll tax, and to be able to read. Massachusetts has two senators and 11 representatives in congress, and consequently has 13 votes in the electoral college. For several years past the sale of spirituous and intoxicating liquors to be used as a beverage has been prohibited under penalties ranging from \$10 fine and 10 days' imprisonment to \$50 fine and six months' imprisonment. Ale, porter, strong beer, lager beer, and all wines, as well as distilled spirits, are considered intoxicating. The lawful sale of intoxicating liquors to be used in the arts, or for medicinal, chemical, or mechanical purposes, is vested in a commissioner appointed by the governor. In 1871 permission was given to towns to authorize the sale of ale, porter, strong beer, or lager beer; but in 1873 this law was repealed. For executing the liquor law and general criminal laws a state police was maintained, consisting in 1874 of 100 men, at a cost of \$145,000. This force was abolished by a law which was passed Feb. 13, 1875, and went into force March 1, and provision was made for the establishment of a state detective force of 31 men, to be appointed by the governor and council. The state board of health, appointed by the governor, makes regulations concerning the slaughter of swine, and may restrain persons or corporations from carrying on noxious or offensive trades.—The funded debt of the commonwealth, Jan. 1, 1875, amounted to \$29,465,204, and was classified as follows: railroad loans, \$14,971,016; war loans, \$12,936,188; ordinary loans, \$1,558,000. Nearly the entire indebtedness of the state is provided for by established sinking funds. The revenue during the year ending Jan. 1, 1875, was \$7,009,313; the expenditures were \$7,183,247, of which \$6,150,391 were ordinary and \$1,032,856 special and exceptional. The chief sources of revenue were:

State tax.....	\$2,000,000
Corporation tax.....	1,299,050
Savings bank tax.....	1,550,501
National bank tax.....	1,132,036
Massachusetts hospital life insurance company.....	89,129
Insurance taxes and licenses.....	263,552
Gas, coal, and mining companies.....	9,893
Troy and Greenfield railroad, rents and interest....	32,838
Interest on deposits and taxes.....	116,808
Commissions.....	7,575
Hawkers and peddlers.....	44,567
Corporation fees.....	9,695
Railroad commissioners.....	22,683
State police.....	13,156
State prison.....	107,209
Reform school.....	22,793
Industrial school.....	7,000
Confiscated liquors.....	19,793
New York and New England railroad company....	89,088
Allen estates.....	4,065
Premium on exchange and loans.....	25,343
Harbor improvements.....	16,059

The entire taxable property of the state on May 1, 1874, amounted to \$2,164,398,548, of which \$1,289,308,763 was real estate, \$542,-

292,402 personal estate, \$30,569,512 bank stock not included in the valuation of cities and towns, \$217,452,120 deposits in savings banks, and \$84,775,750 property of corporations above real estate and machinery taxed in cities and towns. The number of polls was 414,800, on whom the tax amounted to \$875,486. The total

municipal taxation for state, county, city, and town purposes, including highway tax, amounted to \$28,700,605. During the decade ended with 1874 the taxable property of the commonwealth increased to the extent of \$1,032,678,594. The yearly valuation and the annual increase during this period were as follows:

YEARS.	Property returned by local assessors.	Deposits in savings banks.	Corporate excess above real estate and machinery.	Total.	Increase.
1865.....	\$991,841,901 00	\$59,936,482 52	\$79,941,570 77	\$1,181,719,954 29	\$66,987,894 77
1866.....	1,051,816,001 00	67,732,264 81	88,015,184 91	1,237,063,450 22	106,343,495 93
1867.....	1,165,593,413 00	80,481,588 71	85,522,968 02	1,331,547,964 73	94,784,514 51
1868.....	1,220,498,989 00	94,838,386 54	92,326,758 60	1,407,664,034 14	75,816,069 41
1869.....	1,341,069,403 00	112,119,016 64	95,167,745 25	1,548,356,164 89	140,692,180 75
1870.....	1,417,127,876 00	135,745,097 54	92,003,976 00	1,644,936,449 54	96,580,284 65
1871.....	1,496,678,258 00	168,704,077 54	101,208,665 00	1,761,591,000 54	116,654,551 00
1872.....	1,696,599,969 00	184,797,318 92	104,757,278 03	1,986,154,560 95	224,568,560 41
1873, including bank shares.	1,794,216,110 69	202,195,848 70	90,938,561 07	2,087,350,015 46	101,195,454 51
1874, " " "	1,862,170,677 57	217,452,120 84	84,775,750 50	2,164,398,548 91	77,048,538 45

All business corporations are taxed for their real estate and machinery in the place where situated, and their capital stock is taxed by the state at its value over and above the local assessment, the proceeds being distributed to the cities and towns wherein stockholders reside. The property exempted from taxation is valued at \$55,088,592, distributed as follows: religious societies, \$30,455,075; literary, \$13,886,791; charitable and benevolent, \$7,726,031; scientific, \$2,064,200; agricultural, \$956,495. The amount exempted in Boston is \$18,713,100, of which \$10,650,700 is for churches.—The provisions made by the state for the care of the defective and dependent are liberal and systematic. The charitable and correctional institutions are in charge of separate and independent boards of trustees or inspectors, appointed by the governor and council. They are, however, under the general supervision of the board of state charities, comprising seven members, who collect and publish statistical information concerning them, and recommend to the legislature such action as may seem expedient. On Sept. 30, 1874, the wards of the commonwealth, or persons entirely at its charge, exclusive of prisoners, were 3,626; and adding the blind, the deaf mutes, idiots, and others over whom the state exercises some supervision, the total was 4,103. Including the cost of maintaining the county and city prisons, and of supporting and relieving towns' poor, which is not directly borne by the state, more than \$2,000,000 was paid in 1874 for purposes of charity, reform, or correction; and this amount does not include \$470,000 of state aid to soldiers. The ordinary appropriations for public charitable and correctional institutions amounted to \$568,500, besides \$270,000 for charitable purposes outside of institutions, half the latter sum being exceptional. Included in the former sum was \$95,000 for the insane, \$260,500 for the almshouse, workhouse, and juvenile reformatories, \$120,000 for the state prison, \$30,000 for deaf mutes, \$8,500 for the eye and ear infirmary, \$30,000

for the blind, and \$20,000 for idiots. The total income of the state from these institutions was about \$110,000. The institutions, besides the state prison, owned and managed by the state, with the most important statistics for 1874, were as follows:

INSTITUTIONS.	Established.	Whole No. of inmates in 1874.	Average number.	Receipts.	Ordinary expenses.
Worcester lunatic hospital.....	1838	842	476	\$320,006	\$107,534
Taunton lunatic hospital.....	1854	558	480	188,625	96,218
Northampton lunatic hospital.....	1858	621	469	99,906	89,876
Tewksbury almshouse.....	1854	3,022	881	96,553	88,199
Monson primary school.....	1854	715	480	47,209	45,601
Bridgewaterworkhouse.....	1854	798	403	49,310	46,432
Westborough reform school.....	1848	456	328	89,587	53,065
Lancaster industrial school.....	1856	140	93	38,984	21,085
Total.....	.....	7,452	3,606	\$920,435	\$547,960

Of the total receipts, \$343,828 was from appropriations for current expenses, while \$282,000 was granted for new buildings. The entire expenditures amounted to \$885,647. Each of the above named institutions has a farm, and the smallest containing 134 and the largest 375 acres. In 1874 they reported a valuation of \$2,400,911 on real estate and \$608,949 on personal. The institutions at Westborough and Lancaster are reformatories, the former for boys and the latter for girls; admission to both is by sentence of the courts, and for the term of minority. The establishments at Monson and Bridgewater were originally almshouses; the legislation of 1866 converted the one into a primary school and the other into a workhouse; and the almshouse department of each was abolished in 1872. The school at Monson is for children of poverty, boys and girls; admission is granted by the board of state charities. Several hundred children are annually released from these institutions on probation or indenture, and are regularly visited by the state visiting agents. The general duties of

this agency are to look after offending and neglected children, and to promote their welfare. The number of children in families outside the state institutions and subject to supervision Sept. 30, 1874, was about 1,400. The following institutions, not under state control, were also aided by the state in 1874, and received state beneficiaries:

INSTITUTIONS.	Established.	Appropriation.	Whole number of inmates	State beneficiaries.
The Massachusetts charitable eye and ear infirmary, Boston.	1824	\$8,500	6,652	...
The Massachusetts school for idiots, South Boston.....	1848	20,000	143	92
Massachusetts asylum for the blind, South Boston.....	1829	30,000	205	81
The American asylum for deaf and dumb, Hartford, Conn....	1816	.....	.....	85
The Clarke institution for deaf mutes, Northampton.....	1867	30,000	57	49
The Boston school for deaf mutes, Boston.....	1869	.....	.....	55
Massachusetts infant asylum, Brookline.....	1867	4,500	.....	51
Aid of discharged prisoners.....	.....	4,500	.....	427
Relief of disabled soldiers, Boston.....	.....	3,000	.....	...
Total amount appropriated	....	\$100,500	....	840

Massachusetts has provided most liberally for its insane inhabitants. In addition to the asylum in Worcester, which has a capacity for 400 patients, that in Taunton, 500, and that in Northampton, 325, the Tewksbury almshouse has accommodations for 300 chronic harmless insane, and a new asylum capable of receiving 450 is in process of construction at Danvers. Moreover, the McLean asylum in Somerville, which is chiefly supported by private benefactions, will accommodate about 200 patients, the city asylum in Boston about 200, and the county asylum in Ipswich about 70; making the entire capacity for this class not less than 2,450. The number of insane in the state in 1874 was reported at 3,843, of whom 2,625 were under the care of hospitals or overseers of the poor, Sept. 30. The whole number in the various hospitals of the state during the year was 3,380; average number, 2,167; discharged, recovered, 248; improved, 395; not improved, 279; died, 241. Of the number (2,217) remaining Sept. 30, 1874, 821 were supported by the state, 886 by towns, and 510 by individuals. The Massachusetts general hospital in Boston, founded in 1811, affords medical and surgical treatment free to those unable to pay for it. It is supported by the income of its invested funds, to which the state contributed \$75,000, and the gifts of individuals. It receives from 1,500 to 2,000 house patients annually, of whom more than half are treated free of charge, and its average of out patients exceeds 1,000 per month. The state prison in Charlestown, in charge of a warden appointed by the governor, is conducted on the congregate plan, the convicts being separated at meals and at night, but as-

sociated at labor during the day. Disciplinary punishments are the withdrawal of privileges, with solitary confinement in a dark cell. Many of the convicts are taught trades, and a portion of them are instructed in day schools. All are required to attend religious exercises, and have the privilege of a library. The labor of the convicts is let to contractors, and for some years the prison was a source of profit to the state. The income of the institution in 1874 was \$81,098, including \$77,068 earned by the convicts; the total expenses were \$123,673. The number of convicts ranged from 586 to 685, the daily average being 647. The site has been selected in Concord for a new state prison, on the completion of which, according to the original plan, the one in Charlestown will be discontinued. In the several counties of the state, under the management of officers elected by the people, there are 19 jails and 15 houses of correction, though there are but 21 different establishments, as in many cases the jail and house of correction are under one roof. In 1873 the legislature authorized the building of a reformatory prison for women, to be erected within two years, and to it when completed most of the female convicts will be sentenced. Men and women convicted of certain minor offences are sent to the workhouse at Bridgewater, while juvenile offenders are confined in the reformatories at Westborough and Lancaster. An agency for aiding discharged convicts is provided by the state, which appropriated \$3,000 for this purpose in 1874; and there is a temporary asylum for discharged female prisoners at Dedham, supported by gifts and the income of investments, for the benefit of which the state has lately made an annual appropriation of \$1,500. There are also houses of reformation in Boston and Lowell, besides the industrial school at Lawrence, the Plummer farm school at Salem, and truant schools in Worcester, Springfield, and Cambridge; and there are many private organizations for charitable purposes. The whole number confined in state, county, and city prisons in 1874 was 17,856; average number, 3,483. The entire cost of these was \$581,643, while their earnings amounted to \$195,212. The county and municipal prisons are to a limited extent under the supervision of a board of prison commissioners appointed by the governor. During 1874, 4,888 paupers were entirely supported by the state, at a cost of \$268,096; the average number was 2,229. Besides these, there was an average of 4,057 paupers supported by towns, at a cost of \$643,440. Including those partially supported by the state and by towns, the entire cost of pauperism was \$1,412,780, of which \$403,000 was borne by the state. The almshouse in Tewksbury is now the only state establishment for paupers.—The system of public schools in Massachusetts has attained a very high degree of excellence. Every person having under his control a child between the ages of 8 and 14 years is required to

send it to school at least 20 weeks annually, under penalty of a fine not exceeding \$50. Cities and towns must provide truant schools and appoint truant officers, who shall cause the confinement for instruction of habitual truants between the ages of 7 and 15 years. Moreover, there are laws prohibiting the employment of children in manufactories to the neglect of their education. Two agents are employed in visiting the schools of the state for inspection and improvement. In many of the cities and towns text books are furnished free to the pupils in the public schools. The schools are supported by local taxation. The board of education, consisting of 10 members, including the governor and lieutenant governor, has no direct control over the common schools, but exercises an important influence indirectly. It appoints a secretary, who acts as state superintendent, receiving an annual salary of \$3,400, which includes expenses. Most of the cities and towns elect superintendents. The most important information concerning the public schools of the commonwealth for 1873-4 is given in the following statement:

Number of public schools.....	5,435
Persons between 5 and 15, May 1, 1873.....	292,481
Pupils of all ages in public schools.....	297,025
Pupils under 5 years of age.....	2,522
Pupils over 15 years.....	24,657
Average attendance.....	210,243
Ratio of average attendance to whole number between 5 and 15.....	72
Number of male teachers.....	1,073
" of female teachers.....	7,637
Number of teachers who have attended normal schools.....	1,674
Average length of public schools.....	8 mos. and 8 days.
Average monthly wages of male teachers, including high school teachers.....	\$94 88
Average monthly wages of female teachers.....	\$84 34
Raised by taxation for public schools.....	\$4,253,211
Income of funds appropriated for public schools at option of towns.....	\$47,816
Voluntary contributions for school purposes.....	\$11,162
Income of local school funds.....	\$98,960
" of state school fund.....	\$58,032
Salaries of school superintendents.....	\$58,322
Ordinary expenditures.....	\$4,533,558
Expended for school houses, building and repairing.....	\$1,646,670
Number of high schools.....	203
Number attending evening schools.....	10,194
Number attending state charitable and reformatory schools.....	1,219
Number of incorporated academies.....	69
Average number of pupils.....	4,603
Amount paid for tuition.....	\$234,149
Number of private schools and academies.....	402
Estimated average attendance.....	13,144
Estimated amount of tuition paid.....	\$479,395
Total amount paid to maintain public schools, and for instruction of children in reformatory institutions and almshouses.....	\$6,180,848
For each person in the state between 5 and 15 years of age.....	\$21 13

Including the attendance upon academies and private schools (17,800), evening schools (10,194), and charitable and reform schools (1,219), the entire attendance, exclusive of higher institutions of learning, was 326,245; and the entire amount paid for popular education is stated at \$7,080,000. Evening schools were supported in 33 cities and towns, at a cost of \$52,238. According to the census of 1870, Massachusetts contained 5,726 schools, with 1,428

male and 6,133 female teachers, and 169,337 pupils. The total income of all educational institutions was \$4,817,939, of which \$383,146 was from endowment, \$3,183,794 from taxation and public funds, and \$1,250,999 from tuition and other sources. The income of the colleges was \$408,126; academies, \$285,325; private schools, \$533,690. While the number of illiterates over 10 years of age is very large in proportion to the entire population, being .067 per cent., exceeding that of any other New England state except Rhode Island, and that of New York, Pennsylvania, or Ohio, the ratio of native illiterates is smaller than in any of these states except New Hampshire. The statistics of illiteracy previously given show that of 97,742 illiterates 89,830 were of foreign birth, and 85,676 were over 21 years of age. The greatest percentage of illiteracy is found in the manufacturing districts. An important feature has been introduced into the system of education, in accordance with the act of the legislature passed in 1870, which makes industrial drawing a part of the instruction to be given in all public schools, while every city and town of not less than 10,000 inhabitants (23 in number) is required to support free evening drawing schools. The plan of the state director of art education comprehends a 13 years' course of instruction in drawing in the public schools, viz.: three in the primary, six in the grammar, and four in the high schools. Specimens of the drawings made by the pupils are shown in annual public exhibitions. For training teachers of drawing, a state normal art school was opened in Boston in 1873, the legislature having appropriated for this purpose \$7,500. The pupils, Jan. 1, 1875, included 58 males and 130 females, and came from 43 cities and towns. Instruction is given by lectures and recitations, with practice; the course, when fully organized, will comprise elementary drawing, painting, sculpture, and architectural and engineering drawing. This is the first institution of the kind established in the United States, and is free to those intending to become teachers of drawing in the Massachusetts schools. The most liberal provision is made by Massachusetts for training teachers. Besides the normal school of art there are five state normal schools under the direction of the board of education. No charge for tuition is made to those who become teachers in the public schools of the commonwealth; others are required to pay \$30 a year; and \$1,000 is annually appropriated by the state to each school to aid indigent pupils of the former class. The regular course of study occupies two years. One of these institutions is the oldest normal school in the United States, having been established at Lexington in 1839, removed to West Newton in 1844, and to Framingham in 1853. It is exclusively for females, as is also the normal school in Salem. The school in Worcester was opened in September, 1874. The follow-

ing are the statistics of these schools for the year ending Dec. 1, 1874:

WHERE SITUATED.	Estab- lished.	No. of in- structors.	No. of pupils.	Cost of sup- port.
Frammingham.....	1839	11	152	\$11,083 81
Westfield.....	1839	9	204	13,500 00
Bridgewater.....	1840	10	200	12,998 18
Salem.....	1854	12	277	12,077 10
Worcester.....	1874	5	69	4,516 23
Total.....	.....	47	902	\$54,424 82

To those above named may be added the girls' high and normal school and the training school in Boston. Teachers' institutes are held under the direction of the secretary of the state board of education, for which the state appropriates \$4,000 annually. The sessions are from three to five days each, and from six to ten are held annually. Nearly 2,000 normal school graduates are teaching in the public schools of the commonwealth. The state agricultural college in Amherst, established with the aid of the national endowment, was opened in 1866; it has an extensive farm, well supplied with thoroughbred animals, and with the buildings and

apparatus necessary for imparting a thorough industrial education. The course of study occupies four years, on the completion of which the degree of bachelor of science is conferred. There are agricultural, botanical, and veterinary departments. Applicants for admission must be 15 years of age and pass an examination. The tuition fee is \$50 a year. The ordinary annual expenses of the institution are about \$30,000, while the regular income is about \$25,000, including \$10,000 from tuition and room rent and \$15,000 from the permanent cash fund of \$233,333. In 1874-'5 it had 11 instructors and 121 students, a library of 1,500 volumes, and extensive collections in natural history.—Of the leading institutions of learning not under the patronage of the state, Amherst college, Harvard university, and Williams college are described under their respective titles, while Boston college and Boston university are mentioned in the article on that city. The colleges and professional schools of the state are represented in the following statement for 1874-'5, the number of instructors and pupils in the colleges including also those in the professional departments:

TITLE.	Where situated.	Denomination.	When founded.	Number of instructors.	Number of pupils.
Amherst college.....	Amherst.....	Congregational.....	1821	22	331
Boston college.....	Boston.....	Roman Catholic.....	1863	8	155
Boston university.....	".....	Methodist.....	1869	90	439
College of the Holy Cross.....	Worcester.....	Roman Catholic.....	1843	14	165
Harvard university.....	Cambridge.....	Non-sectarian.....	1638	114	1,196
Tufts college.....	Medford.....	Universalist.....	1855	17	83
Williams college.....	Williamstown.....	Congregational.....	1798	13	160
THEOLOGICAL SCHOOLS.					
Andover theological seminary.....	Andover.....	Congregational.....	1807	11	67
Boston university school of theology.....	Boston.....	Methodist Episcopal.....	1847	11	59
Divinity school of Harvard university.....	Cambridge.....	Unitarian.....	1816	5	20
Episcopal theological school.....	".....	Episcopal.....	1867	4	18
New Church theological school (1873-'4).....	Waltham.....	New Jerusalem.....	1866	3	8
Newton theological institution.....	Newton.....	Baptist.....	1826	6	72
Tufts college divinity school.....	Medford.....	Universalist.....	1867	7	27
LAW SCHOOLS.					
Boston university school of law.....	Boston.....	.....	1872	12	121
Law school of Harvard university.....	Cambridge.....	.....	1817	4	139
MEDICAL SCHOOLS.					
Boston dental college.....	Boston.....	Dental.....	1868	10	25
Boston university school of medicine.....	".....	Homoeopathic.....	1873	32	130
Dental school of Harvard university.....	".....	Dental.....	1867	15	83
Massachusetts college of pharmacy (1873-'4).....	".....	Pharmaceutic.....	1823	3	83
Medical school of Harvard university.....	".....	Regular.....	1782	29	192

The number of instructors and pupils above given for the Boston university do not include those in the preparatory departments in East Greenwich academy and the New England conservatory of music in Boston. The school of medicine of this university receives pupils of both sexes. The institute of technology in Boston, which is fully described in the articles BOSTON and EDUCATION (vol. vi., p. 431), is one of the most complete institutions of the kind in the United States. The charge for tuition is \$200 per annum. In 1874-'5 it had 34 instructors and 283 pupils. The Worcester county free institute of industrial science was organized in Worcester in 1868, for practical education in the arts, agriculture, manufactures, mercantile

business, &c. It was founded in 1865 by John Boynton, who gave for the purpose \$100,000; \$200,000 was also contributed by Stephen Salisbury, and a large sum was given by Ichabod Washburn. No charge is made for tuition to residents of Worcester county, and but a small charge to others. In 1869 a grant of \$50,000 was made by the state, in consideration of which the institution will receive 20 pupils annually for the entire course of three years, free of charge. In 1874-'5 it had 10 instructors, 99 pupils, and productive funds amounting to \$367,000. Besides these institutions and the agricultural college, special instruction in science is afforded by the Lawrence scientific school and the mining school of Harvard uni-

versity; in agriculture and horticulture by the Bussey institute, connected with the same institution; and in natural history by the museum of comparative zoölogy in Cambridge and the Anderson school of natural history on Penikese island. (See HARVARD UNIVERSITY, and ELIZABETH ISLANDS.) The university of modern languages at Newburyport has been organized for the purpose of affording to students, without regard to age, sex, or nationality, instruction in European and Asiatic languages, and also modern sciences, by teachers native of the respective countries. The English department is intended for foreign students desiring to learn that language. The endowment fund (1875) exceeds \$300,000, which it is intended to increase to \$1,000,000, and the buildings for domestic and school purposes are in process of construction. The oriental department is to be first opened. The leading institutions for the superior instruction of females are Abbott academy, Andover; Bradford academy, Bradford; Gannett institute, Boston; Lasell female seminary, Auburndale; Maplewood institute for young ladies, Pittsfield; Mount Holyoke female seminary, South Hadley; Notre Dame academy, Boston Highlands; the Orate institute for young ladies, Worcester; Wheaton female seminary, Norton; Wellesley college, Needham; and Smith college, Northampton.—There are not fewer than 150 libraries other than private in Massachusetts containing more than 1,000 volumes each, and about 50 containing 10,000 or more. The largest are that of Amherst college, about 29,000; Andover theological seminary, 32,000; Boston Athenæum, 103,000; mercantile, 20,000; public, 260,500; state, 34,000; Harvard university, 200,000; free public library, New Bedford, 30,000; Essex institute and Athenæum, Salem, 43,000; city library association, Springfield, 36,000; museum of natural history, Springfield, 28,000; American antiquarian society, Worcester, 55,000; and the public library of Worcester, 35,500. According to the census of 1870, the whole number of libraries was 3,169, with an aggregate of 3,017,813 volumes. Of these, 1,625, with 1,007,204 volumes, were private, and 1,544, with 2,010,609 volumes, other than private, including the state library of 35,000 volumes; 95 town, city, &c., 475,853; 18 court and law, 27,708; 20 school, college, &c., 253,127; 1,042 Sabbath school, 539,609; 164 church, 85,956; 11 of historical, literary, and scientific societies, 186,800; 6 of benevolent and secret associations, 63,000; and 186 circulating, 347,556. The whole number of newspapers and periodicals was 259, having an aggregate circulation of 1,692,124, and issuing annually 129,691,266 copies. There were 21 daily, with a circulation of 231,625; 1 tri-weekly, 800; 16 semi-weekly, 41,484; 153 weekly, 899,465; 11 semi-monthly, 45,200; 48 monthly, 462,150; 9 quarterly, 11,400; and 1 annual, 3,000. In 1874 the total number was reported at 321, including 26 daily, 1 tri-weekly, 10 semi-weekly, 212

weekly, 4 bi-weekly, 2 semi-monthly, 55 monthly, and 1 bi-monthly.—The total number of religious organizations was 1,848, having 1,764 edifices, with 882,317 sittings, and property valued at \$24,488,285. The denominations were represented as follows:

DENOMINATIONS.	Organizations.	Edifices.	Sittings.	Property.
Baptist, regular	271	280	182,505	\$3,194,298
" other	15	15	6,280	186,700
Christian	81	81	9,675	128,440
Congregational	500	502	268,814	6,288,827
Episcopal, Protestant	107	99	46,245	2,804,485
Friends	22	29	7,980	21,680
Jewish	5	2	1,500	88,000
Lutheran	2	1	450	20,000
Methodist	297	290	117,825	2,904,100
New Jerusalem	15	12	8,800	199,800
Presbyterian, regular	13	10	5,700	257,825
Reformed church in the United States (late Ger. Reformed) ..	8	3	950	24,000
Roman Catholic	196	162	180,415	8,581,095
Second Advent	15	12	8,400	53,540
Shaker	4	4	1,650	18,600
Spiritualist	19	1	400	1,400
Unitarian	180	179	98,806	8,470,575
United Brethren in Christ ..	1	1	100	500
Universalist	97	67	35,627	1,613,000
Unknown (union)	42	44	10,575	167,470

—The first settlement in Massachusetts was made on the Elizabeth islands in 1602 by Bartholomew Gosnold and 32 English colonists; but it was soon abandoned. Other expeditions visited the coast for the purpose of getting possession of the country, but with unimportant results. On Sept. 6, 1620 (O. S.), about 100 English who had sought religious liberty in Holland, having embarked from Delft Haven, set sail from Plymouth, England, in the Mayflower, of 180 tons, for the purpose of settling in America. They had made terms with the Virginia company, which had received from the crown important privileges in America. They reached Cape Cod Nov. 9, and anchored in the roadstead of the present Provincetown. Before landing they drew up and subscribed a solemn compact or constitution, by the terms of which they were to be ruled; and immediately after John Carver was elected governor for one year. An exploring party spent some days in searching for a favorable place to begin the settlement, and they at last landed at Plymouth, Dec. 11 (O. S.). Here the severity of the weather, exposure, and bad food brought on sickness, which reduced their number nearly one half in about four months. Three months after landing they made a treaty of amity with the Indian chief Massasoit and his people, with whom they long remained friends. With other chiefs and tribes they had occasional disputes and skirmishes, but they were soon freed from serious molestation. In these matters Capt. Miles Standish achieved great reputation. In the spring the Mayflower departed, and shortly after Carver died, and was succeeded by William Bradford, with Isaac Allerton as his assistant. Until 1623, when

they had a plentiful harvest, the colony endured many privations, and were often near famishing. In that year some changes were made in the system of labor, and the plan of common property was abandoned. During this time the colony received accessions from abroad, and other settlements were attempted. A new patent was obtained in 1622 by Mr. Weston of London, formerly connected with the Plymouth colonists, under which he despatched an expedition to settle for him a plantation in Massachusetts bay. They were hospitably received at Plymouth, and commenced a plantation at Wessagusset, now Weymouth. All efforts to obtain a patent from the crown were unavailing, and the Plymouth colonists were thus obliged to carry on their government without the royal sanction. They quietly assumed all the necessary powers and discharged all the functions of the state. A governor, with a council at first of five and afterward of seven assistants, and a legislature consisting at first of the "whole body of the male inhabitants," made and administered the laws by which the state was ruled. In 1628 an expedition commanded by John Endicott reached Salem, having been organized by an English company which had obtained a grant of territory lying between the Atlantic and the Pacific, and extending 3 m. S. of the river Charles and Massachusetts bay and 3 m. N. of every part of the river Merrimack. Endicott's safe arrival excited renewed interest, new associates joined, and a royal patent was at last obtained for the company of the Massachusetts Bay. The charter established a corporation, and the associates were constituted a body politic. Its officers were a governor, deputy, and 18 assistants, to be annually elected. A general assembly of the freemen, to be held four times a year or oftener if required, was intrusted with legislative powers. The question of religious liberty was avoided in the instrument, but the making of laws contrary to those of England was strictly forbidden. In 1629 a reinforcement was despatched, consisting of 300 men, 80 women, and 26 children, with victuals, arms, tools, cattle, and goats; and in the same year it was determined to transfer the government and patent of the company from London to New England. The old officers resigned, and new officers were appointed from among those who intended to emigrate, John Winthrop being made governor. A new emigration was thus promoted, and soon the colony received an accession of about 1,000 persons, who had been conveyed in 17 vessels. Sites for settlements were promptly selected; and the names of Charlestown, Boston, Watertown, Dorchester, Roxbury, Salem, Mystic, Saugus (Lynn), and others, occur in the history of this period. This colony suffered great hardships. Many died, and others returned disheartened to England. The Massachusetts company continued to receive additions from England, and in the exercise of their political and religious

privileges manifested a jealous and vigilant interest. Intolerance led to the banishment of Roger Williams and Anne Hutchinson in the early years of the settlement, as it did later to the persecution of the Quakers. Issues were made between the magistrates and people on the construction of the charter in reference to legislation and representation, the mode of voting was changed from the show of hands to the ballot, and a law against arbitrary taxation was passed; while from 1634 to 1644 a dispute continued concerning the relative powers of the assistants and deputies. The Massachusetts colonists for four years after their settlement had been left to bear their burdens and work out their own way without the interference of England. But the increasing emigration from the latter country, and a suspicion on the part of the crown that the colony desired to be independent, led to an attempt to annul the charter, and the appointment of a special commission for its government, at the head of which was Archbishop Laud. The colony received an order, which they evaded, to deliver up their charter, and at a meeting of the general court measures were taken for the fortification of Boston harbor, Charlestown, and Dorchester, and arrangements made for drilling troops. The political agitations of the mother country preserved the colony from the dangers which threatened her from that quarter. A disturbance with the Pequots led to the Pequot war (1637), the brunt of which was borne by the settlers in Connecticut. On the restoration of the Stuarts new troubles threatened Massachusetts. Its protest against the injustice of being subject to the laws of parliament, acquiesced in by the long parliament, was disregarded by the judges under the restoration, and it was declared to be under the legislative supremacy of parliament without restriction. The colony had addressed the king on his return, praying for the continuance of civil and religious liberties; and Leverett, the agent in London, was urged to support their application. Much controversy ensued, and at length in 1662 a commission sent to England obtained a confirmation of the charter from the king, and a conditional promise of an amnesty for all offences during the late troubles; but the king maintained his right to interfere in the domestic concerns of the colony, demanded the repeal of all laws derogatory to his authority, the taking of the oath of allegiance, the administration of justice in his name, the complete toleration of the church of England, and a concession of the elective franchise to every inhabitant possessing a competent estate. These demands were strongly opposed by one portion of the community, while the other was willing to yield for the sake of quiet. Commissioners charged to investigate the affairs of the colony arrived in 1664. Massachusetts published an order prohibiting complaints to them, and a remonstrance was addressed to the king. After an

unsuccessful attempt to carry out the purposes of their mission, the commissioners went into Maine, and were subsequently recalled. Massachusetts was reproved by the king, while Bellingham, the governor, Hawthorne, and two or three others were commanded to appear in England, but refused. The prosperity of the colonies received a severe check in the war with the Indians, called King Philip's war, which commenced in 1675, and on the part of the savages was one of desperation. During this war, which lasted till the latter part of 1676, and was terminated by the death of Philip, 12 or 13 towns were destroyed, more than 600 of the colonists perished in the field, and about 600 houses were burned. Of the men 1 in 20 had fallen, and of the families 1 in 20 was houseless, while the expenses reached the enormous sum for that day of \$500,000. Though the war had been conducted without assistance from England, it had hardly ceased when an emissary from that country, Edward Randolph, arrived. His pretensions were disallowed, and he returned to excite further hostility against Massachusetts. A committee of the privy council, at the suit of Mason and Gorges, subsequently denied her right of jurisdiction over Maine and New Hampshire, which thus became separated; but the title to Maine was purchased and retained by Massachusetts until 1820. Notwithstanding many concessions, the colony failed to effect a reconciliation with the king. In 1684 the high court of chancery in England gave judgment for the crown against the governor and company of Massachusetts, and their charter was declared forfeited. Joseph Dudley was appointed president of Massachusetts, the general court was dissolved, and the new commission superseded the government under the charter. On Dec. 20, 1686, Dudley was superseded by Sir Edmund Andros. The new governor and his council, in the most arbitrary and illegal manner, proceeded to make laws and levy taxes; and this tyrannous rule was submitted to, not without protest and opposition, for more than two years. In April, 1689, reports having been received of the flight of James and the accession of William and Mary, on a rumor of an intended massacre by the governor's guards, the men of Boston, aided by others from the country, rose in arms, imprisoned Andros and others who were obnoxious, and reinstated the old magistrates. Next day crowds from the country came pouring in; the people took the castle and the frigate *Rose*, and occupied the fortifications; town meetings were held, representatives chosen, and the general court was restored. The same spirit prevailed at Plymouth; Clark, the agent of Andros, was imprisoned, and Hinckley, the former governor, reinstated. Massachusetts took part in 1690 in the intercolonial war between the possessions of France and England. A fleet under Sir William Phips captured and plundered Port Royal. An expedition to Can-

ada failed, and the colony, being unable to pay the troops, issued treasury notes, the first paper money seen in the colonies. A new charter was given in 1692, by which Plymouth was united to Massachusetts. At this period Massachusetts contained a population of about 40,000. It was divided into the counties of Suffolk, Essex, Middlesex, and Hampshire, and comprised 55 towns. Plymouth, with a population of about 7,000, was divided into the counties of Plymouth, Bristol, and Barnstable, and comprised 17 towns. Under the new charter, the governor, lieutenant governor, and secretary were appointed by the king. No act of the legislature was to be valid without the consent of the governor, and he had other important negative as well as positive powers. Sir William Phips was appointed first governor. At about this period occurred the witchcraft delusion. (See SALEM.) In 1703-'4 the province suffered from the French and Indians, who attacked and burned Deerfield, which had been rebuilt since King Philip's war. In 1722 war was resumed with the Indians, and continued until the latter part of 1725, when the troubles with them were terminated. War having been declared between England and France in 1744, the colonial possessions were at once involved. Massachusetts contributed largely to the expedition which captured Louisburg in 1745, and exerted her best energies in the plans for the conquest of Canada and other military operations until the conclusion of peace in 1748. In a few years war again commenced, and the province once more gave her sons and her wealth to the cause of the parent country. The passage of the stamp act aroused the wildest excitement, and its repeal the following year was welcomed with the most extravagant demonstrations of joy. Further plans for revenue were then proposed by the home government, which also refused to withdraw its troops. The arrival of the *Romney* man-of-war renewed the excitement, and Massachusetts issued another circular letter to the colonies which the ministry in vain commanded them to rescind. The Boston massacre in 1770, the destruction of the tea in 1773, the port bill in 1774, are notable incidents preceding the revolution. The province was well represented in the general congress, and the men of Massachusetts were alive to every act of aggression. They took possession of the arsenal at Charlestown, and prepared for the approaching struggle. The assembly adjourned to Concord, and organized as a provincial congress. At Lexington and Concord Massachusetts made the final appeal to arms. Throughout the revolutionary war Massachusetts sustained her former reputation for patriotism and public spirit, and the details of her history at this period will be found in the accounts of those places within her borders which are of historical interest. The population of Massachusetts has been estimated at 200,000 in 1750; 220,000, exclusive of slaves, in 1755;

241,000, including 5,200 slaves, in 1763; and 352,000 in 1775. In 1780 a constitution was framed for the state, which was submitted to the vote of the people and adopted. It is still the supreme law of the state, though several times amended. By a clause in the bill of rights prefixed to it, slavery was soon decided to have been abolished. John Hancock was elected first governor. Six years later, in 1786, civil disturbances commenced in the centre and west of the state, caused by the poverty and distress of a great portion of the people, and the heavy taxes necessary to pay the state debt. An insurrection known as Shays's rebellion from the name of its principal leader, Daniel Shays, broke out, and was not suppressed without bloodshed. The federal constitution was ratified by a state convention, which met in Boston, Jan. 9, 1788, and gave its assent by a vote of 187 to 168. After the formation of the government Massachusetts adhered generally to the federal party, and was foremost among the states opposed to the war with England in 1812, though she furnished great numbers of seamen to the navy. In 1814 she sent delegates to the convention of the New England states which met at Hartford to confer upon the subject of grievances, and to take such measures for relief as were "not repugnant to their obligations as members of the Union." Of that convention George Cabot of Massachusetts was president. In 1820 a convention to revise the constitution proposed various amendments, nine of which were ratified by the popular vote. In the same year the district of Maine was separated from Massachusetts, with the consent of the latter, and erected into a state. In 1857 amendments of the constitution were made, by which the district system of choosing representatives and senators to the state legislature was adopted, in place of the apportionment by towns and counties. During the civil war Massachusetts furnished to the army and navy 159,165 troops, or 181,116 reduced to the three years' standard, the latter being a surplus of 13,492 over all calls by the general government. The losses included 3,749 killed in action, 9,086 who died from wounds or disease, 15,645 discharged for disability contracted in service, and 5,866 not accounted for, of which at least one half were probably deaths. The total expenditures by the state on account of the war were \$30,162,200. Since the close of the war a militia force of about 6,000 men has been maintained, at an average annual expense of \$175,000.

MASSACHUSETTS INDIANS. At the time of the English settlement of Massachusetts the territory was occupied by five Algonquin tribes. The Pennacooks were in the north-east, partly in what is now New Hampshire; the Massachusetts on the bay of that name; the Nausets on Cape Cod; and west of them the Pokanokets or Wampanoags in the south-east. Central Massachusetts was occupied by the Nipmucks or Nipnets; the western part was

uninhabited. All of these tribes were friendly except the Nausets, who had had frequent collisions with the crews of French and English ships. The Plymouth settlers effected a peace with the Nausets, and made a treaty with Massasoit, chief of the Pokanokets. (See MASSASOIT.) The Massachusetts colony entered into similar relations with the Massachusetts and Pennacooks. In 1644 the Mayhews on Martha's Vineyard, and in 1646 John Eliot, began missions to the Indians; and in 1651 Eliot's converts were formed into a community at Natick. For their use he translated the Bible into their language (New Testament, Cambridge, Mass., 1661; whole Bible, 1663). By 1674 the praying Indians or converts numbered 3,200, of whom 1,100 were in Massachusetts, 600 in Plymouth, and 1,500 in Martha's Vineyard. A growing discontent among the Indians culminated in 1675 in what is known as King Philip's Indian war. It began with the rising of the Pokanokets under Philip Metacomet or Pometacom, son of Massasoit; the Nipmucks followed, then the Narragansetts, and finally the Pennacooks. Though not apparently a concerted plot, the rising was almost simultaneous, and all the Massachusetts frontier settlements were ravaged. Even the praying Indians caught the contagion, and numbers joined the enemy. The colonists finally conquered the savages, and the war ended with the death of Philip, Aug. 12, 1676. The Pennacooks after this withdrew in a great measure, joining tribes to the east or in Canada. The other tribes quieted down, having lost heavily, and many having been sent off to the West Indies as slaves. From time to time lands were assigned to the declining communities, and the Indians have gradually mingled with negroes and whites. A careful census in 1861 showed an aggregate of 1,610 Indians or half-breeds in the state: 306 on Martha's Vineyard, at Christiantown, and Gayhead; 438 at Marshpee and Herring Pond, Cape Cod; 12 at Natick; the rest being the Punkapog, Fall River, Hassanamisco, Dudley, Yarmouth, Dartmouth, Mamattakeeset, Turnpum, Deep Bottom, and Middleborough bands, with some stray parties. Since then the tendency has been to assimilate them with the rest of the population. In the United States census of 1870 only 151 Indians are returned from Massachusetts, the rest being counted as white or negro.—For the study of the Massachusetts dialect of the Algonquin, materials are supplied by Eliot's "Indian Grammar Begun" (Cambridge, 1664; Boston, 1832), and "Indian Primer" (Boston, 1720); Cotton's "Vocabulary of the Massachusetts Language" (Cambridge, 1830); and the elaborate studies of Eliot's Bible made by J. Hammond Trumbull, published as yet only in fragments.

MASSAGETÆ, an ancient nomad people of Asia, who dwelt on the steppes adjoining the Jaxartes or Sir Darya and the sea of Aral, and according to some extended further S. E.

They were regarded as Scyths, and were reputed warlike. They worshipped the sun, to which they sacrificed horses. Their very old people were also sacrificed, according to Greek accounts, and the flesh eaten. They raised no grain, but kept cattle and lived largely on fish. Cyrus, the Persian conqueror, is said to have fallen in an expedition against them, when they were commanded by their queen Tomyris. Some critics identify them with the Meshech of the Scriptures.

MASSARUNI, a river of British Guiana, rising about lat. 4° 30' N., lon. 59° 30' W., and holding an extremely circuitous course, first westward, then N. about 70 m., and finally N. and N. N. E., to the extreme southerly point of the estuary of the Essequibo, in which it merges. In lat. 5° 50' N. it receives the waters of the Rupununi and becomes a wide and majestic stream. It has numerous islands. It has been explored by Hillhouse to a distance of 400 m. from its junction with the Essequibo. The navigation of the upper portion is difficult, owing to the frequent rapids and cascades. The river is celebrated as having long been supposed by geographers to form a part of the fabulous lake of Parime.

MASSASOIT, a sachem of the Wampanoags, died in the autumn of 1661, about 80 years of age. His dominions extended over nearly all the southern part of Massachusetts, from Cape Cod to Narragansett bay; but his tribe, once estimated at 30,000 in number, had shortly before the landing of the pilgrims at Plymouth been reduced by a disease supposed to have been yellow fever to about 300. On March 22, 1621, three months after the founding of Plymouth, he appeared there with 60 warriors, armed and painted, for the purpose of forming a friendly league with the white men. Although the tribe were reputed cruel and treacherous, the very open and friendly greeting of Massasoit so favorably impressed Gov. Carver, that after the necessary and imposing formalities were concluded, he formed in behalf of the colony a treaty of peace and mutual protection with the Wampanoags, which for 50 years was sacredly kept. The friendly disposition of Massasoit toward the colonists never relaxed. His residence was within the limits of what is now the town of Warren, R. I., near an abundant spring of water, which still bears his name. Roger Williams, when banished from the Massachusetts colony, on his way to Providence, was entertained by him for several weeks at this place. Massasoit was humane and honest, never violated his word, and constantly endeavored to imbue his people with a love of peace. He kept the pilgrims advised of any warlike designs toward them by other tribes. In person, says Morton in his "Memorial," he was "a very lusty man in his best years, an able body, grave of countenance, and spare of speech." His family consisted of his wife, two brothers, three sons, a daughter, two sons' wives, and a grandson.

His two eldest sons were named Mooanum and Pometacon. Soon after the death of Massasoit these sons went to Plymouth and requested the pilgrims to give them English names. The court named them Alexander and Philip. The former became chief sachem, died within a year, and was succeeded by Philip.

MASSÉ, Gabriel, a French jurist, born in Poitiers in 1807. He was called to the bar in Paris in 1833, and in 1868 became councillor of the court of cassation, and also one of the chief editors of the *Recueil des Arrêts*. In 1874 he succeeded Odilon Barrot in the academy of moral and political sciences. With De Villeneuve he has published *Dictionnaire du contentieux commercial* (2 vols., Paris, 1839-'45; 2d ed., 1851), and is the sole author of *Le droit commercial dans ses rapports avec le droit des gens et le droit civil* (6 vols., 1844-'8; 2d ed., revised and enlarged, 4 vols., 1861-'3).

With Charles Vergé he translated from the German into French with annotations, under the title *Le droit civil français, the Handbuch des französischen Civilrechts*, by Karl Salomo Zacharia von Lingenthal (5 vols., Paris, 1854-'9).

MASSENA, a town and village of St. Lawrence co., New York, 170 m. N. N. W. of Albany; pop. of the town in 1870, 2,560; of the village, 483. The town borders on the St. Lawrence river, and is intersected by the Grass and Raquette rivers, which afford good water power. The village is situated on Grass river, and about a mile S. E. on the W. bank of the Raquette are the Massena springs. These are saline and sulphurous, and are much resorted to in summer.

MASSÉNA, André, prince of Essling, a marshal of France, born in Nice in May, 1758, died in Paris, April 4, 1817. It has been said that he was of Jewish origin, and that his real name was Manasseh. In early life he was a sailor, and subsequently entered the royal Italian regiment in the Sardinian service, in which he served 14 years without rising above the grade of sergeant. On the annexation of Nice to the French republic in 1792 he resumed the profession of arms, was appointed adjutant major and soon after colonel, and by the end of 1793 had attained the rank of general of division. His tactical skill in the Italian campaigns of 1794-'5 attracted attention, and in 1796 Bonaparte gave him the command of the advanced guard of the army of Italy. At Montenotte, Millesimo, Castiglione, Arcole, and Rivoli, Masséna distinguished himself, and Napoleon surnamed him the "favored child of victory." In February, 1798, he was sent to replace Berthier in the Papal States; but the appointment proving unpopular among the troops and the people on account of his character for rapacity and avarice, he soon resigned. In the succeeding campaign his operations against the allied Austrian and Russian armies in Switzerland were attended with brilliant success, and the decisive defeat inflicted by him on the Russian general Korsak-

koff at Zürich, Sept. 25, 1799, saved France from invasion. Directed by Bonaparte to defend Genoa, which was invested by an Austrian army and blockaded by a British fleet under Lord Keith, he sustained a memorable siege of more than three months, and only surrendered (June 3, 1800) when the inhabitants, reduced to desperation by hunger, threatened to rise against him. The concentration of a large Austrian force at this point, however, greatly aided Bonaparte in gaining the important battle of Marengo, fought eleven days after the capitulation of Genoa. Attached from interested motives to the republic, Masséna opposed the establishment of the empire; but his services were deemed by Napoleon too valuable to be dispensed with, and in 1804 he was created a marshal. During the campaign of 1805 he commanded an army of 50,000 men in Italy, where by skilful manœuvres he occupied the attention of the archduke Charles until Napoleon had gained the decisive victory of Austerlitz; and in 1806 he completed the conquest of Naples and established Joseph Bonaparte on the throne of that kingdom. In the campaign of 1809 he commanded the fourth corps of the army. In the battles of Aspern and Essling his firmness saved the retreating French forces from destruction; and the title of prince of Essling was bestowed on him by Napoleon. At the battle of Wagram, where he commanded the left wing, he was obliged, in consequence of a recent injury, to direct the movements of his troops from a carriage. Seeing his men waver at a critical moment, he caused himself to be placed on horseback, and had scarcely changed his position when a cannon ball struck the seat he had been occupying. In 1810 he was appointed chief in command of the army of Portugal, with orders to drive the British troops from the peninsula. Crossing the Mondego in the middle of September with 70,000 men, he followed Wellington to the neighborhood of Lisbon, where his progress was arrested by the famous lines of Torres Vedras. He accordingly fell back to Santarém on the Tagus, to await reinforcements from Soult, who could not spare them. After lingering at Santarém until his army was greatly weakened by sickness and scarcity of supplies, he commenced on March 5, 1811, his celebrated retreat into Spain, "in which," says Napier, "he displayed infinite ability, but withal a harsh and ruthless spirit." In the latter part of April he entered Salamanca, having lost 30,000 men within six months; on May 5 he fought the bloody but indecisive battle of Fuentes de Onoro; and soon after he was obliged on account of ill health to resign his command and return to France. During the whole campaign he had been a confirmed invalid, and to his inability to reconnoitre personally Napoleon ascribed the ill result of his operations. After the restoration of his health he held the comparatively inactive post

of commander of the eighth military division of the empire. He gave in his adherence to the Bourbons at the restoration, and during the hundred days took no part in public affairs. — In military capacity Masséna ranks with the first generals of the empire, although it was said that he never began to act with judgment until the battle was going against him. His private character was stained by imputations of meanness and rapacity, which took definite form in a series of accusations brought against him by the inhabitants of Marseilles. Napoleon called him a "robber," and offered him a present of 1,000,000 francs if he would discontinue his speculations. He paid little attention to discipline or to the comfort of his troops, by whom he was cordially disliked.

MASSEY, Gerald, an English poet, born near Tring, Hertfordshire, May 29, 1828. He was the child of an illiterate couple, who lived in the most abject poverty; and his whole education was confined to a few months at a penny school. At eight years of age he was sent to work in a neighboring silk mill, and was afterward employed in straw plaiting. He read whatever books were accessible to him, and at the age of 15, when he went to London to seek employment as an errand boy, had made himself familiar with the Bible, "Pilgrim's Progress," "Robinson Crusoe," and a few Wesleyan tracts. At the age of 17 he fell in love, and at the same time began to write verses. Some of his early poems, dwelling upon the sufferings of the poor, and the "power of knowledge, virtue, and temperance to elevate them," appeared in a provincial journal; and a collection of them was published in his native town under the title of "Poems and Chansons." The French revolution of 1848 "had the greatest effect on him of any circumstances connected with his life." He started in conjunction with some fellow working men, in April, 1849, a cheap ultra-radical weekly newspaper called the "Spirit of Freedom." This brought him into some prominence among people of his class, and he aided the Rev. F. D. Maurice and the Rev. Charles Kingsley in their plans for coöperative labor by means of workmen's associations. About the same time he married, and his poems, published occasionally in the London journals, began to attract notice. He has lectured extensively on spiritualism (in which he is a believer) and literary topics in Great Britain, and in 1873 in the United States. In 1863 he received a pension on the civil list. He resides in a rustic cottage in his native county, presented to him by Lord Brownlow. He has published "The Ballad of Babe Christabel and other Poems" (1853); "Craigcrook Castle" (1856); "Robert Burns, and other Lyrics" (1859); "Voices of Freedom and Lyrics of Love" (1859); "Havelock's March, and other Poems" (1861); "Shakespeare's Sonnets never before Interpreted" (1866); and "A Tale of Eternity, and other Poems" (1870).

MASSILIA. See MARSEILLES.

MASSILLON, a city of Stark co., Ohio, on the Tuscarawas river and the Ohio canal, at the intersection of the Pittsburgh, Fort Wayne, and Chicago, the Lake Shore and Tuscarawas Valley, and the Massillon and Cleveland railroads, 95 m. N. E. of Columbus, and 50 m. S. of Cleveland; pop. in 1860, 3,819; in 1870, 5,185; in 1874, estimated by local authorities at 7,000. It is regularly laid out, is substantially and compactly built, and contains many handsome residences, and an opera house costing \$100,000. It is surrounded by one of the most productive coal fields of the state, and the coal obtained here has a wide reputation. The Massillon white sandstone, which is largely quarried, is shipped to all parts of the country. Large shipments of iron ore, wool, flour, grain, &c., are also made. There are two blast furnaces, a rolling mill, founderies and machine shops, and manufactories of agricultural implements, iron bridges, and boilers. The city contains three banking houses, two large union school houses, a primary school building, a charity school, two weekly newspapers, a library belonging to the young men's Christian association, and nine churches. It was laid out in 1826.

MASSILLON, Jean Baptiste, a French prelate, born at Hyères, Provence, June 24, 1663, died Sept. 18, 1742. He studied with brilliant success under the Oratorians in his native city, and entered their congregation in 1681. In the monastery of Sept-Fonts he was appointed to reply to the charge of the cardinal de Noailles, which office he fulfilled with remarkable brilliancy and unction; and from that time his talents and culture were directed toward the pulpit. He had been a professor successively at Pézénas, Montbrison, and Vienne, and had gained distinction by several funeral orations, especially by that on Henri de Villars, when in 1696 he was called to Paris to take charge of the seminary of St. Magloire. His sermons soon made him the rival of Bourdaloue, whom in 1698 he succeeded in a mission to Montpellier. In 1699 he preached during Lent in the church of the Oratory at Paris, where Bourdaloue was one of his listeners; and he delivered before the court at Versailles an Advent sermon which caused Louis XIV. to say to him: "I have heard many great orators, and been satisfied with them; but when you spoke, I was very dissatisfied with myself." His sermon on the small number of the elect was delivered for the first time at St. Eustache, and with so great effect that the entire audience rose during the peroration, "as if looking for the archangel to sound." In 1704 he preached a second time at court. He preached the funeral sermon of the prince of Conti in 1709, of the dauphin in 1711, and of the king in 1715. In 1717 he was appointed bishop of Clermont, and was invited to preach during Lent before the young king. The ten sermons, entitled *Petit carême*, which he com-

posed for this occasion, are among his masterpieces, and are esteemed models of French prose and eloquence. From this time the orator gave place to the bishop, and he rarely left his diocese. In 1719 he was received into the French academy, and in 1723 he preached at St. Denis the funeral sermon of the duchess of Orleans. He was noted for zeal, charity, and liberality. As the tendencies of the 18th century began to manifest themselves, his eloquence, without ceasing to be that of a divine, became more and more that of a moralist and philosopher. His complete works were published by his nephew (14 vols., 1745-'6). Subsequent editions were substantially reprints of this, and differed in many respects from the original manuscripts. A better edition, conformable to the manuscripts and containing many unpublished writings and new biographical researches, was published by the abbé E. A. Blampignon, with a portrait (3 vols. 4to, Bar-le-Duc, 1865-'7). His *éloge* before the academy was written by D'Alembert.

MASSINGBERD, Francis Charles, an English clergyman, born in Lincolnshire in 1800, died at South Ormsby, in that county, in December, 1872. He graduated at Magdalen college, Oxford, in 1822, took orders, and became rector of South Ormsby in 1825. In 1847 he became a prebendary of Lincoln, and in 1862 was appointed chancellor of the cathedral. For many years he was zealously occupied in the effort to revive the active powers of the convocation in the church of England. His principal publications are: "History of the English Reformation" (3d ed., 1857); "Law of the Church and State" (1857); and "Lectures on the Prayer Book" (1864). He also published several letters and pamphlets.

MASSINGER, Philip, an English dramatist, born in Salisbury in 1584, died in London, March 17, 1640. His father was a retainer of the earl of Pembroke. In 1602 Philip was entered at St. Alban's hall, Oxford. According to Anthony à Wood, he occupied himself with poetry and romances instead of logic and philosophy, left the university without receiving a degree, and went to London in 1606. Little is known of his life till the publication of his earliest drama, "The Virgin Martyr," in 1622. His name occurs in Henslowe's diary in 1614, in connection with two actors and dramatic authors, and from 1613 he was engaged as joint author with Fletcher, Field, and others. Most of his 18 extant plays were produced in the 10 years following 1622; "The Bashful Lover," the latest of them, was written in 1636. His health seems to have suffered from his laborious career, and his obscurity and lonely death appear from the register of his interment: "March 20, 1639-'40, buried Philip Massinger, a stranger." Five of his extant plays are tragedies; the remainder may be termed tragi-comedies. His most striking excellences are in the conception of character, in dignity of sentiment, and in grace and mel-

ody of style. "The Duke of Milan" is one of the best of his tragedies; "The Picture," "A Very Woman," "A City Madam," and "A New Way to Pay Old Debts," are among his best tragi-comedies. The last alone retains a place on the stage, for which it is indebted to its effective delineation of the character of Sir Giles Overreach. The best edition of his works is that by W. Gifford (4 vols., London, 1805; new eds., 1813 and 1850). His plays, with those of Ford, and with an introduction by Hartley Coleridge, were published in 1848.

MASSINISSA. See MASINISSA.

MASSON, David, a Scottish author, born in Aberdeen, Dec. 2, 1822. He was educated at Marischal college, Aberdeen, and at the university of Edinburgh, and at 19 became editor of a Scottish provincial newspaper. Two years later he went to London, and became a contributor to the magazines, subsequently spent several years in Edinburgh in a similar capacity, and about 1847 established himself again in London. In 1852 he was appointed professor of the English language and literature in University college, London, and in 1865 of rhetoric and English literature in the university of Edinburgh. He has published "Essays, Biographical and Critical, chiefly on English Poets" (1856); "Life of John Milton" (2 vols., 1859-'71); "British Novelists and their Styles" (1859); "Recent British Philosophy, including Remarks on Mr. Mill's Answer to Sir William Hamilton" (1865); "Essays on Wordsworth, Shelley, Keats" (1874); and "Chatterton" (1874). From 1859 to 1868 he was editor of "Macmillan's Magazine."

MASSOWAH, or **Massowah**, a seaport town belonging to Egypt, on an island in the Red sea, in the bay of Massowah, 250 m. N. E. of Gondar, and 420 m. N. W. of Aden; lat. 15° 36' N., lon. 39° 21' E.; pop. about 6,000. The island is a barren rock about $\frac{1}{4}$ m. long, and from 300 to 400 yards broad. The harbor is deep, sheltered, and safe, and can accommodate about 50 vessels. The inhabitants have no water, save what they can collect in tanks. In 1859 the French acquired the port of Zula, about 25 m. S. of Massowah. Owing to the increasing commerce with Abyssinia and Darfoor, Massowah has of late become of great importance. Since 1865 it has been the seat of an Egyptian governor, subordinate to the governor general of Soudan. In 1874 this office was held by the Swiss traveller Werner Munzinger.

MASTER AND SERVANT. The word servant (Lat. *servus*) is a generic term embracing all persons bound or obliged to render service to others, and therefore including slaves; but where slavery does not exist, a servant is understood to be one who by contract has bound himself to render service to another, who in respect to the subject matter of the contract is his master. The law of England distinguishes domestic from other servants, and presumes a hiring when no time is specified to be for a year; but in the United States this distinc-

tion is not recognized. The contract of hiring may be verbal or in writing; if it be for more than a year, it must be in writing, or it will be valid only so far as the parties have acted under it. When the time of service is fixed, neither party has a right to terminate the contract except for cause; and what would be sufficient excuse is sometimes a question of difficulty. The master, if it is part of the contract that the servant shall reside with him, is bound to provide suitably for his wants, though not to furnish him medical attendance or medicine in case of sickness; and ill treatment or blows inflicted upon him are a breach of the implied terms of the contract. On the other hand, the servant must obey all proper directions of the master in respect to the service, must attend faithfully to his duties, and be guilty of no grossly immoral or indecent behavior. The penalty if the servant shall leave the service without sufficient cause, or if the master shall wrongfully discharge him, is the payment of such damages as the other party can show he has sustained; and it is generally held that, as such a contract is an entirety, either party violating it can have no remedy against the other, but on the contrary will be liable to the other for a failure to perform it on his part for the whole period. But where no time is limited by the contract of service, either party may terminate it at his option, except perhaps that where the compensation is to be made by the week, month, or year, a strong if not conclusive inference might arise that the hiring at the outset was for one of these terms, and for another if the service continued after one had expired, and so on. An apprentice is a servant, but subject to some peculiar rules. (See APPRENTICE.) Stewards, factors, and bailiffs are also considered as servants *pro tempore*; and for some purposes any one who assists another in his business, though only as a matter of kindness or favor, is by the law placed in the same category. The most important of these purposes is the protection of third persons who may be injured by the wrongful or negligent act of the person thus in the service of another. The rules of liability in these cases may be thus stated. Where a wrongful act is done by a servant by direction of the master, or in his presence so that his consent may fairly be implied, or as the natural or probable result of directions given by the master, or in the exercise of a discretion which the master has given, the master is answerable in damages to the person injured. So if the servant in the course of his employment conducts himself so negligently, or manages the business with such want of skill or prudence, as to cause an injury to another, the master must respond therefor. These rules, however, do not make the master liable for anything done or omitted by the servant when not acting in his service, or under his express or implied command; but if the servant steps aside from his duty to commit an intentional wrong, he alone is liable there-

for. But this rule is subject to an apparent exception in the case of carriers of passengers. Where, for instance, a railway company receives passengers to be carried, and intrusts them to the care of its conductors and other servants, if the conductor of a train shall cause a passenger who is in no default to be put off the cars, the company will not only be liable in that case upon the presumption that the conductor was acting in obedience to its orders, but it would also be liable if the conductor should in defiance of orders and wilfully and wantonly inflict an injury upon the passenger, because it was the duty of the company to see to it that the contract of carriage be not intrusted for execution to those who would either negligently or purposely violate it. It should be observed in respect to these rules of liability on the part of the master, that they do not apply in favor of one of his servants who is injured by the carelessness or negligence of a co-servant, but the servant is considered to have taken upon himself by the contract of hiring all risks of that character; though if he can show that the servant causing the injury was an incompetent or unfit person to be engaged in such employment, and that the master knew it when he employed him, thereby tracing the negligence back to the master, he may hold the latter responsible. One class of persons who make it their business to perform service for others are not held to be servants so far as to make the master liable for their negligent torts. These are such as act in an independent employment, and not under the immediate control, direction, or supervision of the employer. The man who draws goods for me by the day or week is my servant, but the railway company that transports them is not, neither is the licensed drayman.—Corresponding to his liabilities to third persons, the master has some rights. One who entices his servant away from him before his time of service has expired, or who injures him so that he cannot labor, or who seduces his female servant, is liable to him in damages; and in the last mentioned case heavy punitive damages are sometimes allowed to be recovered. The courts consider any female a servant who is living with and performing service, however slight, for another, whether under contract or not; and a father, at the common law, only recovers for the seduction of his daughter on the ground of her being his servant. In general, where a third person has a right to hold the master liable for the servant's act or non-feasance, he may at his option hold the servant also; and on the other hand, though the master may sue for an injury to the servant whereby he has lost his service, so the servant may have an action on his own account to recover the damages which are personal to himself. It should be observed that, though the officers of a corporation are regarded as its servants, yet the chief executive officer or superintendent of its business is for many purposes, so far as third

persons are concerned, regarded as standing in the place of and representing its principal for the purposes of control and direction of other officers and servants; and the liability of the corporation will be the same for acts done under his direction as though done by direction of the corporate board of management.

MASTER SINGERS (Ger. *Meistersänger*), a class of minstrels who flourished in Germany during the 14th, 15th, and 16th centuries. They were generally of burgher extraction, and in the reign of the emperor Charles IV. were formed into regular corporations, for admission to which a course of apprenticeship was required. Their chief seats were the imperial cities, and they flourished most at Nuremberg. The compositions of the members, consisting chiefly of devotional and Scriptural pieces, were subjected to a peculiar code of laws, and the main faults to be avoided, 82 in number, were distinguished by particular names. At public contests in Nuremberg, a board of four judges, called *Merker*, sat to hear the poems recited or sung, and mark the faults in each. The first compared the recitation with the text of the Bible lying before him, the second criticised the prosody, the third the rhymes, and the fourth the tunes. He who had the fewest marks received the prize, and the successful competitors were thereupon permitted to receive apprentices. These corporations began to decline in the 17th century, and have been succeeded in modern times by the *Liederkränze*, *Sängerbünde*, and other singing societies. Among the most famous master singers were Hans Sachs, Muscatblüt, and Michael Behaim.

MASTIC (Gr. *μαστίχη*, from *μασᾶν*, to chew or eat, so named from the practice of chewing the substance which prevailed formerly as at



Mastic Plant (*Pistacia lentiscus*).

present in Greece), a resinous exudation from the bark of the *pistacia lentiscus*, a shrub about 12 ft. high, found upon the borders of the upper Mediterranean. The drug is ob-

tained from the island of Scio or Chios in the Grecian archipelago, and from northern Africa and western Asia. It was known to the ancients, being correctly described by Dioscorides and Pliny, and that from Chios being particularly recommended by Galen. It is collected during July or August, when the juice slowly exuding from the tree hardens in tears on the bark, or on cloth placed to receive it, or falls upon the ground. The best quality, known as mastic in tears, consists of tears of various sizes, pale yellow, semi-transparent, roundish, oval, or flattened, and brittle. The more ordinary kind, termed mastic in sorts, is obtained in irregular masses, mixed with bark, sand, and other impurities. Mastic has a sweet resinous odor and an aromatic taste. Alcohol dissolves about 90 per cent. of it, leaving a tenacious resin that is soluble in turpentine. Chloroform, ether, and oil of turpentine are its proper solvents. By the inhabitants of the countries from which it is procured mastic is considered highly efficacious in purifying the breath and preserving the teeth, and it is extensively used for these purposes by the Turkish ladies. It is friable when first put into the mouth, but by chewing becomes soft and opaque. It is sometimes used for filling decayed teeth. Dissolved in oil of turpentine, it makes an excellent varnish used upon pictures, but of late for this and other uses it is largely superseded by the Australian resin dammar. Mastic has little medicinal effect, although it is an ingredient of a popular dinner pill composed of aloes, mastic, and red-rose leaves; the use of the mastic is to completely divide the aloes.

MASTIFF (*canis urcanus*), a variety of the dog family, large and powerful, with truncated muzzle and elevated skull, strong neck, muscular back, and robust limbs. The condyles of the lower jaw are above the line of the upper molars; the head is large, with the ears small and partly drooping; the tail truncated and carried erect; there is occasionally a fifth hind toe. The mastiff is calm, dignified, courageous, not easily irritated, but when angry a most determined and fierce assailant. If we seek for the original where the race is now the most numerous and in the highest perfection, it would be in the mountains of Thibet, though there is no similar wild animal in that region; the nearest wild type is the *lycaon* of the Cape of Good Hope (see *HYÆNA*), which possesses many of the characteristics of the mastiffs. The mastiff form became known to the Greeks about the time of the Macedonian conquest, and the classic Roman writers describe the pendulous lips, fiery eyes, loose folds of skin above the brows, and other characters of the modern mastiff of Thibet. The color of the Asiatic breed is generally very dark, almost black, with a few tan-colored spots about the face and limbs. The mastiff of Thibet is the largest and finest of the breed, and extends through S. and E. Tartary. The English mastiff, perhaps derived from this, but smaller and

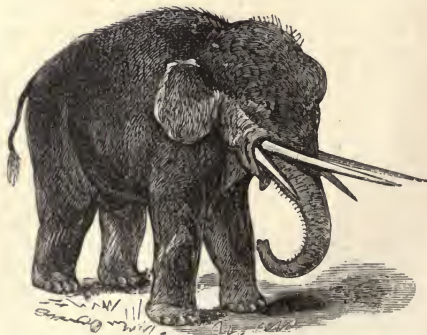
somewhat crossed with the stag and blood hounds, is more elegant in form and more majestic; the color is usually dark buff, with dark muzzle and ears; one mentioned by Ham-



Mastiff (*Canis urcanus*).

ilton Smith measured 29½ in. in height at the shoulder, and others are described as engaging singly with the lion, and able to cope with the bear and leopard. On the continent of Europe they are generally white, with large clouds of black or reddish; they have been seen 30 in. high at the shoulder. Mastiffs are very sagacious, and make excellent watch dogs.

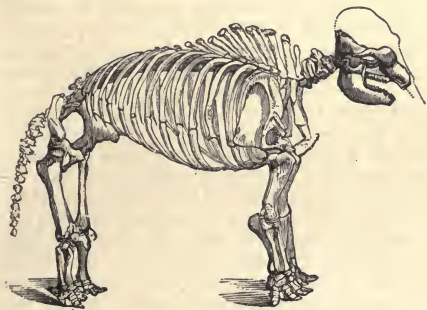
MASTODON (Gr. *μαστός*, nipple, and *ὄδους*, tooth), an extinct proboscidean mammal, coming near the elephant, found either in the tertiary or more recent deposits in all quarters of the globe except Africa. This animal has the vaulted and cellular skull of the elephant, with large tusks in the upper jaw, and heavy form; from the characters of the nasal bones



Mastodon giganteus.

and the shortness of the head and neck, it has been concluded that it had a trunk; the crowns of the molars are divided by transverse rows of mammillary conical prominences, whence the

name; besides the upper incisors or tusks, the cheek teeth are $\frac{3}{2}$, succeeding each other from behind forward, as in the elephant, only two or three being in use at a time; during youth there were two short and straight tusks at the end of the lower jaw in the males, which were retained sometimes to adult life. The best known species is the North American mastodon (*M. giganteus*, Cuv., or *M. Ohioticus* of Falconer); this has been fully described in a superb work by Dr. John C. Warren, assisted by Dr. J. F. W. Lane ("The Mastodon Giganteus of North America," 2d ed., 4to, Boston, 1855), to which the reader is referred for the fullest details and abundant illustrations of most of the species. A few remains of the mastodon had been discovered in North America as early as 1705, but not until 1801 was anything like a complete skeleton obtained, when a tolerably complete one was procured from the morasses of Orange co., N. Y.; this was carried to London in 1802, but was soon returned to this country, where it occupied a prominent place in Peale's museum at Phila-



Skeleton of Mastodon.

delphia until 1849 or 1850, when it suddenly disappeared; it was imperfect, wanting a considerable part of the head, some vertebræ, ribs, and bones of the limbs; it was believed by Dr. Warren to have fallen into the possession of Prof. Kaup of Darmstadt, Germany. Another skeleton, less perfect than the last, obtained at about the same time, was exhibited in Baltimore for years, and in a dismounted state came into the possession of Dr. Warren of Boston in 1848, where it still remains. About 1840 Mr. Koch procured a rich collection of mastodon bones from the banks of the Missouri, and put together a nondescript animal, the so-called *Missourium*, which drew crowds of visitors in New York and London, until from the mass of bones of several individuals a tolerably complete skeleton was made up by Prof. Owen, which is now in the British museum. The skeleton now at Cambridge, Mass., was discovered in Warren co., N. J., in 1844; with this young female were found four very perfect heads, a number of fine teeth, and several bones. The finest skeleton of this

species is the one described by Dr. Warren in the work above mentioned; it was discovered at Newburgh, N. Y., in 1845, in a swamp usually covered with water, but left dry during that summer; it is now in Boston. Specimens have been found in New York, New Jersey, Indiana, Kentucky, Alabama, Missouri, Kansas, Texas, and other states, and as far as lat. 65° N. —Taking Dr. Warren's specimen as the type of this species, the cranium is flatter than in the elephant, narrow between the temporal fossæ, the face becoming twice as wide below the nasal opening; the length of the superior surface, from the vertex to the edge of the premaxillary bones, is 48 in., and the width between the superior orbital processes 28 in.; the posterior or occipital surface is nearly vertical, roughened for muscular attachments; the temporal fossæ are of great size, indicating the power of the muscles which filled them; the zygomatic processes thick and strong; lower jaw V-shaped, the anterior pointed extremity having on the internal surface a long wide groove for the tongue. The cervical vertebræ have short spinous processes, except the last, which is $6\frac{1}{2}$ in. long; the dorsals are 20, and, with the 3 lumbar, form a considerable arch, the first 7 having very long spinous processes (that of the 3d, the longest, being $23\frac{1}{2}$ in.), and thence gradually diminishing to the last, which is only 4 in.; the transverse processes are also very thick in the first seven; the first lumbar measures across the transverse processes 17 in., of which the body is only 5 in.; the sacrum consists of five bones, and is 20 in. long on the lower surface; caudals probably about 22, very strong at the commencement of the tail, which reached to the knees. The pelvis is very strong and massive, 6 ft. 2 in. wide across the anterior superior spinous processes; thorax rounded, its anterior opening 2 ft. from above downward and 1 ft. transversely; sternum keeled below, with a stout pointed protuberance in front. The ribs are 20, 13 true and 7 false, the first nearly vertical and resembling a clavicle, and 28 in. long; from this the ribs increase to the ninth, which is $54\frac{1}{2}$ in., and thence decrease to the last, which is 21 in.; the fifth, flat anteriorly, is 4 in. wide; after the seventh they become rounded; they are not unfrequently found united, as after fracture. The scapula is more nearly equilateral and in this respect more human than in the elephant, and like some of the other bones might in rude ages be easily mistaken for the remains of giant men; its spine is nearly vertical, bifurcating below, the infra-spinous fossa more than three times as ample as the supra-spinous, the former having generally a depression near the spine; the glenoid cavity is 11 by 5 in. The massive humerus is 39 in. long, and the same in its greatest circumference, with a remarkable projection extending two thirds down the limb for the deltoid muscle; the circumference of the elbow joint is 44 in.; radius 29 in. long and $6\frac{1}{2}$ in. wide below;

the ulna much the stoutest, and 34 in. long. The fore foot measures nearly 2 ft. across; the wrist has eight bones, in two rows of four each; metacarpals five, the first or thumb the smallest (4 in. long), the second and fourth 5 in., the third (the largest) 6½, and the fifth about 4½; phalanges in thumb two, and in the others three each, supposing an ungual phalanx to be present in all, though wanting in the skeleton. The thigh bone is massive and about as long as the humerus, 17 in. in circumference at the middle and 30 at the lower portion; the knee pan nearly globular; tibia human-like, 28 in. long, 30 in. in circumference above and 13½ in the middle; fibula 26 in., ascending less high than the tibia, but descending lower to form the external malleolus; feet more depressed, and the toes more radiating, otherwise much as in the elephant. This skeleton is 11 ft. high, 17 ft. from end of face to beginning of tail, the latter being 6½ ft.; circumference around ribs 16 ft. 5 in.; tusks about 11 ft., of which 8½ project beyond the sockets. The teeth consist chiefly of dentine invested by enamel, though a layer of cement, thinner than in the elephant, invests the



Tooth of Mastodon.

fangs and is spread over the crown. The whole number of teeth is 24, of which rarely more than 8 were in use at one time; they are developed from behind forward in order to relieve the jaws from the excessive weight of the whole at one time; the outer edge of the upper teeth projects beyond that of the lower. Two on each side in each jaw are developed soon after birth, and are shed early. In the lower jaw, the first is small, 1½ in. by ¾, and ¾ in. high, with two transverse bifid ridges slightly notched, and two projecting much curved fangs; the second, immediately behind it, has the same characters, but is larger, 1½ by 1½ in., and 1½ in. high, with a prominent heel; the third is three-ridged and six-pointed, 3 by 2 in., and 1½ high; the fourth is 3½ by 2½, and 1½ in. high, with the inner mastoid eminence notched; the fifth is 4½ by 3 in., with the inner points notched; the sixth is four-ridged, with complex heel and deeper cleft furrows, 8 by 3 in., and 6½ high; the last sometimes has five ridges. The first and second of the upper jaw resemble those of the lower; the third is three-ridged, 2½ by 2 in.; the fourth is three-ridged, 3 by 2½ in. (and sometimes much wider), with the eminences notched; the fifth is also three-ridged, 4 by 3 in., each with two eminences; the sixth is four-ridged, with a small heel, the points sometimes bifurcated, and the furrows deep, 6½ by 3 in., sometimes larger, even to 9½ by 5½, and with five ridges. There is no evidence of an additional premolar

under the second lower milk tooth, though there may be such in the upper jaw, as in other species of mastodon, and in the tapir. At an advanced age the sixth tooth remains alone on each side above and below; in a case mentioned by Dr. Warren there was a seventh or supernumerary tooth on one side of the lower jaw, 7 in. long and 7½ high. Besides the upper tusks, there are in the mastodon, though not in the elephant, inferior mandibular tusks. The food of the mastodon was entirely vegetable, as is proved by the remains of the twigs of coniferous trees, leaves, and other vegetable matter found between the ribs; and the animal doubtless resorted to marshy and boggy places, like other proboscideans, in search of succulent plants, where it was often mired in the very places whence its remains have been extracted during the 19th century. Around the Shawangunk skeleton were found tufts of dun-brown hair varying in length from 2 to 7 in.; so that the mastodon, like the Siberian mammoth, may have been clothed to withstand a climate considerably colder than that in which modern elephants live. The bones of *M. giganteus* have not been generally found in a mineralized state; in Dr. Warren's specimen they are light-colored, of less specific gravity than recent bones, and retain from 27 to 30 per cent. of animal matter (bone cartilage); both bones and teeth, however, have been found silicified, and they are generally impregnated with iron, which it is well known has a great preserving power.—The geological position of the remains of this species has long been and still is a subject of dispute among geologists; in a few instances they are said to have been found below the drift, in the pliocene, and even in the miocene; but they have generally been obtained from the post-pliocene or alluvial formations at a depth of from 5 to 10 ft., in lacustrine deposits, bogs, and beds of infusorial earth; Pomel and others consider them diluvial; the bones of this mastodon and of the fossil elephant have been found in company in Ohio, South Carolina, Texas, the pliocene of Nebraska, and various other parts of North America. Some have thought that the mastodons became extinct since the advent of man upon the earth, like the dinornis and the dodo; according to Lyell, the period of their destruction, though geologically modern, must have been many thousand years ago. The same causes probably acted in their extinction as in the case of the fossil elephant, perhaps partly climatic changes, but more probably some great convulsion on the surface of the globe at an epoch anterior to man.—About 30 species of mastodon have been described, for details on which see the work of Dr. Warren and those referred to by him. In South America lived the *M. Humboldtii* (De Blainv.), belonging to the narrow-toothed group, of which the European *M. angustidens* is the type; this is characterized by the shorter rostrated extremity of the lower jaw, the apparent absence of lower

tusks, and folds of enamel more complicated than in the teeth of *M. giganteus*. *M. Andium* (Cuv.), a smaller species, considered by D'Orbigny the same as the last, had the same undulating folds of enamel, but a more elongated symphysis. The distinction between the *M. longirostris* (Kaup) and the *M. angustidens* (Cuv.) of Europe is not well made out, and authors differ exceedingly as to the limits of these species. The division of Pomel seems as probable as any; he describes as *M. longirostris* (or *Arvernensis*, Cr. and Job.) those having a lengthened lower jaw, four ridges in the third, fourth, and fifth teeth, five and sometimes six in the ultimate molar, tusks in the lower jaw, and a vertical upper premolar; the *M. angustidens* he limits to the Italian species, with the same narrow teeth and four ridges in the three penultimate molars, with no beak to the lower jaw as in *M. longirostris*, or short truncated gutter as in *M. giganteus*, but with a long horizontal semi-canal slightly inclined downward. The bones, according to De Blainville, resemble more those of the Asiatic elephant than the American mastodon. Dr. Falconer, on the contrary, considers the *M. angustidens* and *longirostris* as perfectly distinct, and the former as more nearly related by a three-ridged penultimate molar to the *M. giganteus* than to the *M. longirostris*, placing the first two in the section *trilophodon* (with three ridges), and the last with the Asiatic species in the section *tetralophodon* (with four ridges to the third, fourth, and fifth molars). The famous Dusino mastodon (*M. Turinensis*), discovered near Turin in 1849 in a fluviolacustrine deposit, described by Prof. Sismonda, whose description is partially reproduced with a figure in Dr. Warren's work, belonged to the *M. angustidens*; in the same deposit were found remains of elephants and other large pachyderms. Pomel's other species, less clearly made out, are *M. Cuvieri*, with a prolonged lower jaw and the three penultimate molars with three ridges; *M. tapiroides*, with tuberculated teeth, forming a connecting link with those of the dinotherium (both of the last are found in central and southern France, the *M. longirostris* having been found in central Germany, at Eppelsheim); and the *M. Buffonis*, with short thick teeth, to which he refers the Siberian specimens. The age of the European mastodons was earlier than that of the American, their remains having been found as low as the miocene, and probably long anterior to the elephant, which was a contemporary of the American mastodon; according to Pomel, *M. angustidens* is found with *M. Buffonis* in pliocene, and *M. Cuvieri* and *tapiroides* in miocene lacustrine deposits; but at Turin bones of the elephant, rhinoceros, hippopotamus, and tapir were found with the Dusino specimen, so that the fossil elephant of the old world would seem to have been anterior to that of the new. Pietet describes also *M. brevisrostris* (Gervais), from the pliocene of the south of France, with

the lower jaw short as in elephants, the lower tusks not at all or slightly developed, and the molars as in *M. longirostris*, with secondary tubercles between the ridges; he mentions other species as found in the pliocene of Puy and Auvergne. Two species found in Asia may be mentioned here in conclusion—the *M. Sivalensis* (Falc. and Cautl.), from the Sivalik hills, and the *M. latidens* (Clift), from the banks of the Irrawaddy; in the former the teeth are very large, the ultimate molars being from 8 to 9½ by 3 to 3½ in., with six ridges in the upper jaw, rounded mammillæ, and rather narrow form; in the latter the form is broader, and the teeth sometimes with as many as ten ridges, and seemingly one of the links connecting mastodon with elephant; these belong to the section *tetralophodon*. The specific name of *tetracaulodon* given by Dr. Godman to some mastodon specimens, from their having two tusks in the lower jaw, is now generally admitted to be ill-founded; lower tusks are found in young males of many species, and sometimes one or both in the adult male, their presence being probably a sexual and not a specific character. Dr. Leidy and others have indicated several species of mastodon in Kansas and Nebraska, and other newly explored regions of North America; these are described in the "Proceedings" of the Philadelphia academy of natural sciences. Several specimens have been found near Cohoes and Ithaca, N. Y., and recent explorations have indicated their presence in all the middle, northern, and western states.—According to Owen, the mastodons were elephants with molars less complex in structure and adapted for coarser vegetable food, ranging in time from the miocene to the upper pliocene, and in space throughout the tropical and temperate latitudes. The transition from the mastodon to the elephant type of dentition is very gradual.

MASTODONSAURUS. See LABYRINTHODON.

MASUDI, Abul-Hasan Ali ben Husain ben Ali, an Arabian scholar, born in Bagdad about 890, died probably in Cairo in 956. He belonged to a family illustrious from the time of Mohammed. From childhood he exhibited remarkable talents and fondness for study, and attained a universality of erudition which has been equalled by no other Arab. On some important questions he expressed ingenious and novel views, which were in advance of his successors for several centuries. Not content with the information contained in books, he undertook several long journeys. About 914 he visited the ancient Persepolis, and passed thence to India, Ceylon, the coast of China, Madagascar, and southern Arabia, and explored the region of the Caspian sea. About 926 he was in Palestine, and he subsequently dwelt in Syria and in Egypt. He says he travelled so far to the east that he forgot the west, and so far to the west that he forgot the east. His most important work is the *Akhbar al-zaman*, or "History of the Times,"

an immense general history, which has never been printed; no copy of it exists in Europe. His second work, entitled *Kitab al-wasat*, or "Book of the Middle," treated curious questions in history, geography, philosophy, and the sciences; but copies of it are very rare, and unknown in Europe. Perceiving that these works were too voluminous to be popular, he wrote a smaller history, entitled *Moruj al-dheheb ve-maadin al-jewahir*, or "Meadows of Gold and Mines of Gems," which is not rare in the libraries of Europe. The first volume has been translated into English by Dr. Aloys Sprenger (London, 1841); there is a French translation by Derenbourg, and an edition of the original with a translation by Barbier de Meynard (7 vols., Paris, 1861-'73). He is the author of a variety of other works on religion, morals, medicine, and the sciences, some of which are extant in manuscript, and others are known only by their titles.

MASULIPATAM, a town of British India, capital of a district of the same name, on the bay of Bengal, 220 m. N. by E. of Madras; pop. about 30,000. The native town is connected by a causeway with the fort, which contains military establishments, a Protestant and a Roman Catholic church, and several residences. Cotton goods and other articles manufactured here were formerly largely exported to the Persian gulf, but this business has greatly fallen off. The central part of the town belongs to the French government, and, not being amenable to British authority, is a resort of smugglers.

MAT, a coarse fabric made by interweaving strips of the inner bark of trees, flags, rushes, husks, straw, grass, rattans, or similar materials, and used for covering floors, for beds, and a variety of other purposes. In Paris mats were commonly employed as tapestry for lining the walls of rooms till some time in the last century. They serve among rude nations as a substitute for wooden doors and glass windows. By gardeners they are employed to protect delicate plants from frost. Mats are supposed to be the first fabrics that were woven by man; and almost all savage tribes now possess considerable skill in their manufacture. The grass mats of the South sea islands are often of great beauty for their fineness and the brilliant colors of their dyes. The Japanese cultivate a peculiar species of rush for making mats, and the softness

and elasticity of these well adapt them for beds or floor coverings. The Chinese make rattan floor mats of all sizes, but chiefly about 7 ft. by 5; also rush floor mats, and table mats of rattans and rushes, all of which are exported. In Europe, mats from reeds and rushes are largely produced in Spain and Portugal; but in Russia the manufacture is a prominent branch of national industry. The material there employed is the bark of the lime or linden tree, and the mats are known in Europe as "bast" mats. In the governments of Vi-atka, Kostroma, and those adjoining, the villages are said to be almost deserted during May and June, the whole population being in the woods stripping the trees. (See LINDEN.)

MATAGORDA, a S. E. county of Texas, bordering on the gulf of Mexico and Matagorda bay, intersected by the Colorado river and Caney creek; area, 1,334 sq. m.; pop. in 1870, 3,377, of whom 2,120 were colored. The soil of the Colorado and Caney bottoms is deep and rich, equally adapted for the cultivation of sugar and cotton. West of the Colorado are large prairies with light sandy soil clothed with luxuriant pasture. Timber (mostly oak, cedar, pecan, and hackberry) is confined to the banks of the streams. The chief productions in 1870 were 94,195 bushels of Indian corn, 13,777 of sweet potatoes, 12,285 lbs. of wool, 22,225 of butter, 1,590 bales of cotton, and 55 hogsheads of sugar. There were 2,341 horses, 808 mules and asses, 1,395 milch cows, 93,877 other cattle, 8,488 sheep, and 2,811 swine. Capital, Matagorda.

MATAMOROS, a frontier city of Mexico, in the state of Tamaulipas, on the right bank and 40 m. from the mouth of the Rio Grande, oppo-



The Cathedral, Matamoros.

site Brownsville, Texas, and 450 m. N. of Mexico; pop. about 12,000. It is situated in a plain on a bend of the river. The streets are wide and cross each other at right angles,

and the houses are mostly of brick and built after the American style. Churches and convents are numerous; and there are several public and private schools. In fair weather good-sized vessels are towed up to the town; while at other times the entrance to the river, obstructed by sand bars, is difficult and often impossible even for schooners. The climate is extremely hot from April to September, with violent south winds, while from December to March, in the season of the northers, it is very cold, often with much snow. Although considered to be one of the most unhealthy places in Tamaulipas, Matamoros is the only gulf port exempt from yellow fever. Specie, hides, wool, and horses are the principal exports; cotton, linen, woollen, and silk fabrics, and machinery are imported, mainly from the United States and Great Britain.—Matamoros was founded toward the commencement of the present century. The Americans under Gen. Taylor occupied the town in May, 1846, after the victories at Palo Alto and Resaca de la Palma. The people are mainly of Spanish descent; but there are many American residents, and English is almost as commonly spoken as Spanish.

MATAMOROS, Mariano, a Mexican patriot, executed at Valladolid, Feb. 13, 1814. The time and place of his birth and the circumstances of his early life are unknown. In December, 1811, he was parish priest of Jantelolco,

a small village south of Mexico, when, being molested by royalist troops and threatened with imprisonment, he fled to Izucar and joined the insurgents. He was favorably received by Morelos, and at once made a colonel. In that capacity he speedily acquired influence and popularity among the troops, and displayed great military talent. In the defence of Cuautla against Gen. Calleja, the glory attributed to Morelos was largely due to Matamoros. In the expedition to Oajaca he took a conspicuous part, and in October, 1813, won the victory of San Agustin del Palmar. The Mexican revolution was now triumphant from Guatemala to Jalisco, except in a few of the larger cities, when Morelos injudiciously resolved to attack the capital of Michoacan. Repulsed from Valladolid, Matamoros collected his forces at Puruaran, where Morelos again rashly precipitated an action fatal to the cause of independence. Matamoros was captured and executed. Alaman in his history describes Matamoros as the most active and successful leader of the insurrection, and ascribes its temporary failure to his death. His memory is highly honored by the Mexicans; his bones were placed with those of Hidalgo and Morelos in the cathedral of Mexico, and his name has been given to two important towns, as well as to districts in several states.

MATANZAS, a fortified seaport of Cuba, on the San Juan river, here crossed by a bridge, and



Matanzas.

at the head of a beautiful bay of the same name, 53 m. E. of Havana; pop. about 30,000, a considerable decrease since 1868, attributable to the large numbers who emigrated after the outbreak of the revolution in the island. The town stands on a gentle slope toward the river; the streets are wide, regular, well kept, and lighted with gas; and the houses, chiefly of stone, are solidly built, and in the same style as those of Havana. The handsomest of the public squares is the plaza de Armas, where military bands attend every evening, and the walks are crowded with fashionable prome-

naders. There are two churches, a castle, fine barracks, a hospital, a good theatre, and a cockpit; and among the schools, which are proportionately more numerous here than in any other Cuban town, is the Empresa academy, one of the best educational establishments in the West Indies. The harbor is spacious, easy of access, and well sheltered, save to the northeast; and the surrounding country, comprising the richest portion of the island, is covered with magnificent sugar estates. The climate, though hot, is more salubrious than that of Havana. The principal exports are sugar, molasses, and a

little coffee. The quantities of the first exported in 1871, '72, and '73 were as follows:

YEARS.	Boxes.	Hogheads.	Total in lbs.
1871.....	954,874	191,469	608,585,850
1872.....	1,218,625	287,389	821,508,750
1873.....	1,269,665	205,044	764,171,000

The imports include manufactured goods, bread-stuffs, and provisions, mainly from the United States, and machinery, partly from Great Britain and partly from the United States. About 500 American vessels of all sizes visit the port annually; and the coasting trade, especially with Havana, is very extensive. Matanzas is connected by two lines of railway with Havana.

MATAPAN, Cape. See CAPE MATAPAN.

MATARÓ, a maritime city of Catalonia, Spain, in the province and 16 m. N. N. E. of the city of Barcelona; pop. about 17,500. It is divided into the old and new towns; the former on a declivity, with narrow and crooked streets, and the latter with regular and spacious streets, and well built. There are eight squares. Besides the parish church, embellished with good paintings by Viladomat and Montaña, there are several chapels, two convents, a city hall, court house, prison, and barracks. The hospital and the custom house are fine structures. There is a college founded in 1737. Mataró is a prosperous manufacturing town, producing cotton, linen, woollen, and some silk fabrics, sails, ropes, glass, hardware, soap, leather, wine, and brandy. Timber and fruit are also exported. Fishing is extensively carried on. Mataró is connected with Barcelona by a railway opened in October, 1848, the first built in Spain.

MATCH, a small stick of combustible material furnished with some very inflammable composition, and used for producing fire. It is commonly known in England as the "lucifer match" or "lucifer." In 1680, a few years after the discovery of phosphorus, that substance was introduced for this purpose in London by Godfrey Hanckwitz, who applied it by rubbing it between folds of brown paper till it took fire; it was then made to ignite a stick, one end of which had been dipped in sulphur, and which may be considered the earliest form of the common match. Another form extensively used was called chemical matches, which were sold in little cases called phosphorus boxes, containing a few matches, at first as high as 15s. a box. They were small sticks of wood dipped first in sulphur, and then in a composition of chlorate of potash, flowers of sulphur, colophony, gum or sugar, and cinnabar for coloring. Accompanying them in the box was a vial containing sulphuric acid, into which the match being dipped, it was instantly ignited by the chemical action induced between the acid and chlorate of potash. The other ingredients were added merely on account of their combustible qualities. The primitive flint, steel, and tinder, however, remained in common use till the in-

vention of the lucifer match in 1829, by Mr. John Walker, chemist, at Stockton-upon-Tees. In his experiments upon chlorate of potash, he found that this could be instantly ignited by friction, as in rapidly drawing a stick coated with it and phosphorus by means of mucilage or glue through folded sand-paper. Mr. Walker manufactured but few of these matches for use in his neighborhood. Faraday, learning of them, procured some, and brought them into public notice. Their useful properties were soon perceived, and their manufacture rapidly increased, till it became an important branch of industry in Europe and the United States.—The best wood for matches is clear white pine, which possesses the softness required for the manufacturing process, together with the necessary stiffness and inflammability; and the quantity of this consumed in their manufacture is enormous. The wood is first sawed into blocks of uniform size, and the length of two matches. By machines of ingenious construction, these are afterward slit without loss of material into splints. They are then dipped in melted sulphur, and afterward in phosphorus composition. Round matches are formed by forcing the wood endwise through holes in plates, which in the English works are an inch thick, with steel face and bell-metal back. In American establishments tubes are employed whether for round or square splints. The perforations are made as near together as possible, only leaving enough of the metal between to give the necessary strength for cutting. This invention was patented in England by Reuben Partridge in 1842.—Matches are now often made without sulphur, paraffine oil being employed for saturating the wood. According to Böttger, the best composition for matches consists of phosphorus 4 parts, nitre 10, fine glue 6, red ochre 5, and smalt 2 parts. "Safety lucifer matches" are made, in which a part of the combustibles, as the phosphorus, are placed upon one surface, as a piece of sand-paper, while the other part, containing chlorate or nitrate of potash, is placed on the tip of the match. Neither match nor sand-paper singly will take fire from friction except when rubbed against each other. To prevent matches from smouldering, the wood is sometimes soaked in a solution of alum, borax, Glauber salts, or Epsom salts.—Nearly all the operations of match making, formerly conducted by hand, are now accomplished by machinery. In large establishments four machines are used for cutting, dipping, and delivering the matches. Two-inch pine plank is sawed up the length of the match, which is $2\frac{1}{4}$ in. These go into the machine for cutting, where at every stroke 12 matches are cut, and by the succeeding stroke pushed into slats arranged on a double chain, 250 ft. long, which carries them to the sulphur vat, and thence to the phosphorus vat, and thus across the room and back, returning them at a point in front of the cutting machine, where

they are delivered in their natural order. They are gathered up by a boy into trays, and sent to the packing room. In this manner 1,000 gross or 144,000 small boxes of matches are made in a day. No correct statistics of match making can be given, but it has been estimated that six matches a day for each individual of the population of Europe and North America is the average consumption. From these figures it is easy to see that the business is enormous.

—The acid fumes thrown off from phosphorus in the various processes of making matches frequently cause among the people employed a terrible disease which attacks the teeth and jaws; and to such an alarming extent did it prevail in Germany, that the attention of the government was called to it. The dippers are most liable to suffer in this way, in consequence of standing for hours over the heated slab upon which the phosphorus is spread. As persons with decayed teeth are most susceptible to the disease, they are carefully excluded from some manufactories. No antidote has yet been discovered to this disease. Its natural course is to rot the entire jaw bone away. (See PHOSPHORUS.)—Insignificant as matches are, it is important, on account of the immense numbers made, that the manufactories should be in districts where timber is cheap. Some of the splints are exported to the West Indies and South America. The matches themselves are largely exported to the East and West Indies, Australia, China, Mexico, South America, &c.

MATÉ, or **Paraguay Tea**, the leaves of a native holly found in South America, an infusion of which is drunk by the people as tea is by Chinese and Europeans. The leaf and the drink



Yerba Maté (*Ilex Paraguayensis*).

are called *maté*, the aboriginal name for the cup used in preparing the infusion. The plant, called *yerba maté*, is the *Ilex Paraguayensis*, a holly which grows upon the banks of rivers in

Paraguay and in the mountains of Brazil; it is a tree 15 or 20 ft. high, and when allowed to develop itself forms a handsome head, but where its branches are collected it is only a moderate-sized shrub with numerous stems from one root. The ovate lanceolate leaves are persistent, 4 to 5 in. long, with their margins unequally serrate; the numerous white flowers are in umbellate clusters, and succeeded by a four-seeded berry about the size of a pepper grain. The leaves are collected by parties of 20 to 50 persons, who go to the forests prepared for an encampment of several months. The first step is to prepare a hard earthen floor, by beating the ground with mallets; over this an arch of poles is built, upon which are laid the leafy branches of the *maté*, where they are kept over a lively fire made beneath until thoroughly scorched; after this roasting, the leaves are beaten from the branches by means of sticks, in which operation they are reduced to a coarse powder. The broken leaves are packed in leathern sacks made of a bullock's hide, which contain from 200 to 220 lbs. A day's work for a peon is the collection of a sufficient amount to make 200 lbs. of the prepared *maté*. Several varieties are known, depending upon the development of the leaf and the care taken in the preparation of it. The method of using it is to place a handful of the leaves in the *maté* or cup, and pour boiling water over them; as soon as the infusion is sufficiently cool to be tolerated, it is sucked through a tube called a *boquilla*, which is perforated with holes at the lower end to prevent the entrance of fragments of the leaves; the cup is passed from one to another, each person among the South Americans using the same tube in turn; but Europeans living in the country carry a small glass tube which can be slipped into the opening of the cup. The latter is frequently a calabash fixed upon a stand, and among the wealthy mounted with silver, or sometimes entirely of silver and elaborately ornamented. The Europeans found the *maté* in use by the aborigines and readily adopted the custom, and it is estimated that no portion of the world consumes so large an amount of Chinese tea in proportion to the population as is used of the *maté* by the South Americans. The infusion of *maté* is usually drunk without addition, though some use sugar and others lemon with it; it is described as having great fascination to those accustomed to it, and those who commence drinking it find it almost impossible to abandon its use. It is taken at every meal and at all hours of the day, and marvellous stories are told of its virtues; like tea and coffee, it no doubt enables the system to resist fatigue, and its use among miners and others who undertake hard labor is universal in most South American countries. It seems to act as an excitant to the stomach, and in large doses is emetic and purgative. Its more important properties, however, are probably closely allied to those of ordinary tea or cof-

fee, as it contains nearly one half of one per cent. (0.45) of caffeine and 20.88 of caffeotannic acid. The amount of the leaves exported annually from Paraguay is estimated at over 5,000,000 lbs. The early Jesuit missionaries, knowing the fondness of the aborigines for the maté, established plantations of the tree, on which account it is sometimes called Jesuits' tea. The leaves of a related species, *ilex cassine*, furnished the "black drink" or *yaupon* of the Creek Indians; the leaves of this possess emetic qualities, and the power of resisting them was regarded as a mark of superiority.

MATERA, a town of S. Italy, in the province and 43 m. E. of the city of Potenza, on the Gravina; pop. about 14,000. It is the seat of an archbishop, and has a royal school of belles-lettres, medicine, law, and agriculture, and manufactories of firearms. Near it are the famous caverns of Monte Scaglioso.

MATERIA MEDICA. See MEDICINE.

MATHEMATICS (Gr. μάθημα, or μάθησις, learning), as usually defined, the science of quantities; or more precisely, the science which determines unknown quantities by means of their relations to known quantities. But the tendency of modern thought is to give the term a much wider meaning, to include under it all exact sciences, and to designate as mathematical every science which can be reduced to a limited number of definite conceptions from which all the propositions which constitute the science can be deduced in accordance with the rules of logic. It is defined by Kant as the science of the laws of space and time, since it treats of the quantities occupying space and time, and representable by diagrams, numbers, or symbols. In this he has been followed by De Morgan and some other mathematicians. But in order to make the science conform to the definition, they have been obliged to regard the idea of number as included or implied in the idea of time. The present tendency of mathematical speculation is to regard mathematics, when considered in its most general form, as a branch of the science of mind, and every mathematical formula as expressing an operation of the understanding. This doctrine is expressly asserted by Ohm, and seems to be implied, if not expressly stated, in the writings of Grassmann, Peirce, and many other modern mathematicians.—The science is distinguished as pure or mixed mathematics, according as it treats of laws and relations *in abstracto*, with reference to nothing actual, or *in concreto*, with reference to existing phenomena. The former, dealing with abstract quantity, does not imply the idea of matter; the latter, dealing with concrete quantity, embraces the actual material world. The former gives the absolute forms of the universe; the latter, their illustrations by real examples. The elements employed by the former are self-evident principles, suggested or immediately grasped by the reason itself; the latter applies these principles to natural objects, the properties of which

must be learned by induction from experience. The former treats of possible, the latter of actual magnitudes.—The branches of pure mathematics are arithmetic, geometry, algebra, analytical geometry, and the differential and integral calculus. Arithmetic is the science and art of numbers. It does not calculate functions or relations, but special values in every case. Its single elementary idea is one or unity, from which all other numerical values, integral or fractional, are formed. The processes of arithmetic lie at the basis of all others. Geometry measures extension, comparing portions of space with each other. Its elements are not numbers, but lines, surfaces, and volumes or solids. Lines have only the dimension of length, and are either straight or curved. Surfaces embrace both length and breadth, are either plane or curved, and are distinguished as triangles, quadrilaterals, polygons, &c., according to the number of lines within which they are contained. Solids combine the three dimensions of length, breadth, and thickness, and are distinguished as the cube, pyramid, cone, sphere, &c., according as they are bounded by planes, by plane and curved surfaces, or only by curved surfaces. Definitions, or statements of *a priori* facts, axioms, or statements of self-evident relations, and propositions, deduced from definitions and axioms, as premises, in a series of logical arguments, are the three classes of geometrical truths. Algebra, analytical geometry, and the differential and integral calculus embrace the entire portion of mathematical science in which quantities are represented, not by numbers or diagrams, but by letters of the alphabet. In arithmetic, all propositions concerning numbers, embracing units of the same kind, are true without regard to the nature of the quantities to which the numbers may be applied. In geometry, every figure represents all the properties inherent in all the figures of its class. But the truths both of arithmetic and geometry are applicable only to special and actual classes of things. Algebra has a broader generalization. Its symbols extend to all objects whatsoever, and do not suggest ideas of particular things. They stand as representatives of things in general, whether abstract or concrete, real or hypothetical, known or unknown, finite or infinite. Having the relation of quantities embodied in an equation of symbols, we may proceed to trace what other truths are involved in the one thus stated, resolving the symbolical assertion step by step into others more fitted for our purpose, thus following long trains of symbolical reasoning, every result of which must express some general truth, though, in the present state of our knowledge, we may not be able to give any actual example of the truth. Analytical geometry, the application of algebra to geometry, is that branch of mathematical science which examines, discusses, and develops the properties of geometrical magnitudes, by noticing the changes which take place in their representative alge-

braic symbols. The geometrical question is solved by resolving the corresponding algebraic equation. Algebra being defined as the ordinary analysis, calculus is the transcendental analysis, and has various applications in the higher departments of the science. The best achievements of modern mathematics are due to it.—To these branches of mathematics the 19th century has added another, the final form of which is as yet undetermined, but the essential characteristics of which are to be found in the “quaternions” of Sir W. Rowan Hamilton, in the *Ausdehnungslehre* of H. Grassmann, and in the “Linear-Associative Algebra” of Prof. Peirce. The great characteristics of this new science are: 1, the introduction of several units differing in quality; and 2, the rigid distinction between the multiplier and the multiplicand, or between the thing which acts and the thing acted upon. In the mathematical sciences, as hitherto treated, xy is always equal to yx ; it is a matter of indifference which quantity we regard as multiplier and which as multiplicand. In the new science the distinction must be always regarded; xy and yx are entirely different things. The second characteristic is really a result of the first. Thus, in geometry, as treated by Grassmann, we have four different units, viz., a point and three mutually perpendicular straight lines. From the combinations of these units all the truths of geometry are deduced. Prof. Peirce, in his work above mentioned, has endeavored to fix *a priori* the laws which must regulate this introduction of units, and has divided algebra, according to the number of units introduced, into single, double, triple, &c. We can enter into no further explanations of this branch of mathematics, but will remark that as the great event in the intellectual history of the 17th century was the invention of the calculus, so perhaps future historians will regard this as the great event in the history of the 19th century.—Algebra and geometry are usually, but not with strict accuracy, regarded as types respectively of analytical and synthetical reasoning. The former has an artificial language. Symbols are operated upon according to certain general rules, while the mind dismisses altogether the conceptions of the things which the symbols represent, whether lines, angles, velocities, forces, or whatever else. The steps in the processes are merely applications of the rule. The elements are symbols, and the results are only equations. Geometrical reasoning, on the contrary, is concerning things as they are. It retains the conceptions of quantities. It apprehends the nature of the new truths which it introduces at every step. Analysis is therefore the more powerful instrument for the professed mathematician, but geometry is the more effective mode of exercising the reason, and is a more useful part of the gymnastics of education.—Comte, who makes mathematics preëminent in the hierarchy of the positive sciences, intro-

duces a peculiar classification. Abstract mathematics, according to him, embraces ordinary analysis, or the calculus of direct functions, and transcendental analysis, or the calculus of indirect functions. The former includes arithmetic and algebra; the latter, the differential and integral calculus and the calculus of variations. Concrete mathematics embraces synthetic and analytic geometry, the former being either graphic or algebraic, and the latter being distinguished according as its objects are of two or three dimensions. Comte includes also rational mechanics, or the laws of statics and dynamics, as a department of concrete mathematics. If the universe were immovable, there would be only geometrical phenomena; but motions are mechanical phenomena.—As commonly explained, the mixed mathematics are the applications of abstract mathematical laws to the objects of nature and art. From the universality and variety of these objects, no strict and comprehensive classification of them has been made. Matter in rest and matter in motion are the primary phenomena in space and time. The laws which rule the one and the forces which impel the other are the first objects of inquiry. Mechanics treats of both, and is divided into statics and dynamics, dealing respectively with the equilibrium and the action of forces. Astronomy, hydraulics, pneumatics, optics, and acoustics may be regarded as subdivisions of dynamics. Surveying, architecture, fortification, and navigation are among the principal applications of mathematics to the arts.—The pure mathematics are merely formal sciences. They occupy and discipline but do not fill the mind. Their entirely formal character will be best appreciated by one or two illustrations. It is a law of falling bodies that the spaces passed through by the falling body are proportional to the squares of the times during which it falls. It is a law of geometry that the areas of circles are proportional to the squares of their radii. The mathematical formula expressing one of these laws also expresses the other. Let $A : a = b^2 : B^2$, and we may consider A and a as representing either spaces described by a falling body or areas of circles, and B and b as representing either the times during which it falls or radii of circles. In either case the formula is true. Yet the space described by a falling body and the area of a circle, the time during which a body falls and the radius of a circle, are wholly disparate notions. When we see a person adding a column of numbers, no inspection of the column itself will tell us what the person who wrote it down intended to represent by those numbers. He may have had in his mind sums of money, or yards of cloth, or bushels of wheat. Whatever it was, the process of finding the sum is in all cases the same. Again, an engineer investigating a problem in regard to bridge building, an actuary one in life insurance, a machinist one in mechanics, might all arrive at the same algebraical for-

mula. The formula expresses merely a relation between the different objects, and the relation in all these cases may be the same, although the objects themselves have nothing in common. The engineer, the actuary, and the machinist would each interpret the formula in accordance with the nature of the objects about which he was specially concerned.—The attempt has often been made to give to philosophical speculations a mathematical form, in order to give them mathematical certainty. Thus Pythagoras sought in the ideas of order and harmony mysteriously attached to numbers the reasons for great cosmical phenomena. Plato, who forbade any one unacquainted with geometry to enter his school, combined mathematical with philosophical doctrines especially in his "Timæus," the most obscure of his dialogues. The Neoplatonists revived the Pythagorean mystical views of numbers. In modern times Spinoza, Wolf, and Herbart have been chiefly distinguished for introducing the mathematical method into ethical and metaphysical systems. The latter wrote a work on psychology abounding in algebraic formulas. These attempts have led to no important results. The definitions, axioms, and processes of mathematics deal with objects of sense, which are known with perfect exactitude, which are apprehended as precisely the same by all, concerning which as phenomena there can be no such thing as opinion, but only absolute certainty, and the reality of the relations between which can be doubted only by disputing the validity of all human ideas. In none of the most scientific metaphysical and moral systems have the definitive and axiomatic elements been thus precisely and authoritatively determined.—The history of mathematics may be divided into three great periods, each characterized by the introduction of important new methods. In the first, the era of Greek and Roman supremacy, geometry was almost exclusively cultivated. While arithmetic was hardly more than a mechanical calculation by means of the abacus, geometrical methods attained a degree of elegance scarcely to be surpassed, as appears from the rank still maintained by Euclid. After the decline of Rome, the sciences took refuge among the Arabs, who translated and preserved the literary treasures of Greece. The Arabian philosophers were, however, rather learned than inventive, and added little to the heritage. But they introduced the second great period in the progress of mathematics by imparting to Europe the decimal arithmetic and the algebraic calculus, both of which were perhaps of Indian origin. The latter, diffused in Italy by Leonardo, a merchant and traveller of Pisa, early in the 13th century, soon received important improvements. Scipio Ferrea (1505) was the first to solve a cubic equation. Cardan and Tartalea disputed the honor with him and with each other, while Ferrari solved the biquadratic equation, and Vieta (1600), Girard,

and Harriot entered upon the general theory of equations. The algebraic analysis was thus brought nearly to its present state of perfection. It was at first regarded merely as a preparatory process in the investigation of a problem, to be afterward exchanged for a geometrical construction and synthetic proof. But it gradually supplanted diagrams as a medium of demonstration, being found to surpass them in force and compass. With Descartes begins a great revolution of mathematical science. His mode of characterizing curves by an equation between two variable magnitudes revolutionized the mode of conceiving geometrical questions. Symbolical language, found adequate for every purpose, soon became the general medium of mathematical inquiry, and has been the principal weapon by which its subsequent splendid triumphs have been achieved. Perceiving the importance of the discovery, Descartes hastened to apply it to questions of the greatest difficulty and generality, and resolved the problems of tangents and of maxima and minima. The methods of Roberval and Fermat tended toward the discovery of the differential calculus, which was made independently by Newton (under the form of fluxions) and by Leibnitz. Already Napier had invented logarithms, and Newton the binomial theorem; Mercator had accomplished the quadrature of the hyperbola, and Wallis the quadrature of many other curves while seeking that of the circle. The integral calculus (the Newtonian method of quadratures), the inverse of the differential, was improved by Leibnitz and the Bernoullis; Euler extended the theory of analytical trigonometry; Fontaine illustrated that of differential equations; Taylor invented the calculus of finite differences or increments; Cavalieri published his method of indivisibles; and other improvements were introduced by Kepler, Huygens, and Wallis. The *Principia* of Newton (1687) has gained for him the title of "the profoundest of geometers as well as the first of natural philosophers;" and his influence combined with that of Leibnitz in preparing for the achievements of the mixed mathematicians. Euler, D'Alembert, and Daniel Bernoulli were the most distinguished of their successors till near the close of the 18th century. Euler suggested conceptions in the application of analysis which others elaborated in almost every part of mathematical science; D'Alembert established a principle by which every dynamical question was resolved into a statical one; Daniel Bernoulli received ten prizes from the French academy of sciences; and other contemporaries, as Clairaut and MacLaurin, were extending the application of mathematics to mechanics and physics. In the period embracing the latter part of the 18th and the early part of the 19th century, the names of Lagrange and Laplace had no rivals. By them the application of all modes of calculation to the mechanics of the universe was carried to the highest pitch of generality and

symmetry. One of the most remarkable achievements of the science was Leverrier's prediction in 1846 of the place and orbit of the planet Neptune from the motions of Uranus, announcing before its discovery by the telescope the existence, position, and magnitude of a body beyond the recognized limits of our system, merely as an inference from the perturbations of the outermost planet known to us. Poisson, Airy, Plana, Hansen, Gauss, Adams, De Morgan, and Peirce are among the recent mathematicians who have solved important problems in the physical application of analysis. Many new mathematical theories have been originated during the last half century. Among them may be mentioned the theory of determinants, the theory of invariants of Messrs. Cayley and Sylvester, that of cinants of Mr. Ellis, and many others. Some of them will probably pass into history only as evidences of the ingenuity of their authors, while others promise to be of great value. As they are of interest to professed mathematicians only, they require no further notice in this work.—Among the greatest works in mathematical literature are the *Principia* of Newton, the *Mechanica* of Euler, the *Théorie des fonctions* and the *Mécanique analytique* of Lagrange, the *Application de l'analyse à la géométrie* of Monge, and the *Mécanique céleste* of Laplace.—See Montucla, *Histoire des mathématiques*, continued by Lalande (4 vols., Paris, 1799–1802); Bossut, *Essai sur l'histoire des mathématiques* (2 vols., Paris, 1802); Comte, *Philosophie positive*, vol. i., and *Synthèse positive*; Libri-Carucci, *Histoire des sciences mathématiques en Italie* (4 vols., Paris, 1838–41); Montferrier, *Dictionnaire des sciences mathématiques* (2d ed., 3 vols. 4to, Paris, 1844), and *Encyclopédie mathématique d'après les principes de la philosophie des mathématiques de Hoëne Wronski* (4 vols. 8vo, Paris, 1856–9); Fries, *Die mathematische Naturphilosophie* (Heidelberg, 1822); Poppe, *Geschichte der Mathematik* (Tübingen, 1828); Ohm, *Versuch eines vollkommenen, consequenten Systems der Mathematik* (3d ed., Nuremberg, 1853–5); Bartholomæi, *Philosophie der Mathematik* (Jena, 1860); Davies, "Logic and Utility of Mathematics" (New York, 1851); and Davies and Peck, "Mathematical Dictionary" (New York, 1856). See also the works cited under the title GEOMETRY.

MATHER. I. Richard, an English clergyman, born at Lowton, Lancashire, in 1596, died in Dorchester, Mass., April 22, 1669. He received a good education, became a schoolmaster at Toxteth Park, near Liverpool, at the age of 15, was admitted to Brazenose college, Oxford, in 1618, was ordained a few months later, and became the minister of Toxteth, where he remained 15 years. He was suspended for nonconformity to the ceremonies of the established church in 1633, and, though soon restored by the influence of friends, was again silenced in 1634. He therefore emi-

grated to New England, landing in Boston Aug. 17, 1635. In the following year he became pastor of the church in Dorchester, where he resided till his death. He was the author of several brief theological treatises and letters, chiefly on church government, and drew up in 1648, at the instance of the Cambridge synod, a model of discipline, which was accepted. He married in 1656 the widow of John Cotton. Of his six sons by his first wife, four were distinguished clergymen and authors: Samuel (1626–71), in Dublin, Ireland; Nathaniel (1630–97), in London; Eleazar (1637–69), in Northampton, Mass.; and Increase. His "Journal, Life, and Death" has been published for the Dorchester antiquarian and historical society (Boston, 1850).

II. Increase, an American clergyman, son of the preceding, born in Dorchester, Mass., June 21, 1639, died Aug. 23, 1723. He graduated at Harvard college in 1656, and in 1658 at Trinity college, Dublin. He afterward preached in Devonshire and the island of Guernsey. He returned to America in 1661, and was pastor of the North church, Boston, from 1664 till his death. He was a member of the synod of 1679, and drew up the propositions which were adopted concerning the proper subjects of baptism. In 1681 he was elected president of Harvard college. The reluctance of his church to relinquish him induced him to decline the office; but in 1685 he accepted it with a stipulation that he should retain his relation to his people. He continued in this station till 1701, when he retired in consequence of an act of the general court requiring the president to reside in Cambridge. He procured an act authorizing the college to create bachelors and doctors of divinity, and received in 1692 the first diploma for the degree of D. D. that was granted in America. When in 1683 Charles II. demanded that the charter of Massachusetts should be resigned into his hands, Mather was foremost in opposing the measure; and when that monarch annulled the charter in 1684, he was sent to England as agent for the colonies. He was in England during the revolution of 1688, and, finding it impossible to obtain a restoration of the old charter, accepted a new one, under which the appointment to all the offices reserved to the crown was confided to him. He returned in 1692, when the general court appointed a day of thanksgiving for his safety and for the settlement of the dispute. He is said to have condemned the violent proceedings which followed relating to witchcraft. He was accustomed to spend 16 hours every day in his study, and always committed his sermons to memory. One tenth part of all his income was devoted to charity. He was the author of 92 distinct publications, now mostly very scarce. Two of these were written in Latin. His "Remarkable Providences" was republished in the "Library of Old Authors" (London, 1856), with an introduction

by George Offor. He married a daughter of John Cotton. **III. Cotton**, an American clergyman, son of the preceding, born in Boston, Feb. 12, 1663, died Feb. 13, 1728. He studied at the free school in Boston, and graduated at Harvard college in 1678. In his 14th year he began a system of rigid and regular fasting and vigils, which he continued through life, and at the age of 16 made the Christian profession. After leaving college he taught, and having overcome an impediment in his speech, he then devoted himself particularly to theological studies. In 1680 he became the assistant of his father in the pastorate of the North church, Boston, and in 1684 was ordained as his colleague. It was his aim to maintain the ascendancy which had belonged to the clergy in New England in civil affairs, but which was then on the decline; and in 1689 he prepared the public declaration justifying the imprisonment of Gov. Andros. In 1685 he published his "Memorable Providences relating to Witchcraft and Possessions," narrating cases which had occurred at intervals in different parts of the country, which was used as an authority in the prosecution of the "Salem tragedy." When the children of John Goodwin became curiously affected in 1688, he was one of the four ministers of Boston who held a day of fasting and prayer, and favored the suspicion of diabolical visitation. He afterward took the eldest daughter to his house in order to inspect the spiritual and physiological phenomena of witchcraft, and his experiments are wonderful instances of curiosity and credulity. He discovered that the devils were familiar with the Latin, Greek, and Hebrew, but seemed less skilled in the Indian languages, suspected that they were not all alike sagacious, and was persuaded that he himself was shielded against their power by special protection of Heaven. A discourse, in which he pronounced witchcraft "the most nefarious high treason against the Majesty on high," was printed with a copious narrative of his recent researches, and the particulars were reprinted in London with a preface by Richard Baxter. When the first phenomena occurred at Salem in 1692, he at once became a prominent adviser concerning them, expressing his eagerness "to lift up a standard against the infernal enemy," whose assaults upon the country he regarded as "a particular defiance upon my poor endeavors to bring the souls of men unto heaven;" and in order to convince all who doubted the obsessions and disapproved of the executions, he wrote his "Wonders of the Invisible World" (1692), which received the approbation of the president of Harvard college and of the governor of the state, though it was designed to encourage the excesses and to promote "a pious thankfulness to God for justice being so far executed among us." When the reaction in the popular mind followed, he vainly attempted to arrest it; and though he afterward admitted that "there

had been a going too far in that affair," he never expressed regret for the innocent blood that had been shed, and charged the responsibility upon the powers of darkness. Finally, he sought to shun the odium of the popular feeling by declaring the subject "too dark and deep for ordinary comprehension," and referring it for decision to the day of judgment. By the publication of Robert Calef's "More Wonders of the Invisible World" (London, 1700), in which the veracity of many of the narratives of Mather was disputed, the delusion was at length dissipated. Though his influence declined, his activity continued. His publications amounted to 382, many of them small books and sermons. His *Magnalia Christi Americana* (London, 1702; 2 vols., Hartford, 1820) is a chaotic collection of materials for an ecclesiastical history of New England, concerning which he was admitted to know more particulars than any other man. In 1713 his *Curiosa Americana* was read before the royal society of London, and he was elected to that body, being the first American to receive this distinction. In its "Transactions" in 1721 appeared an account of the practice of inoculation for the smallpox; and by the efforts of Mather in connection with Dr. Boylston, against both professional and popular prejudice, the operation was first performed in Boston. His "Essays to Do Good" (1710) and his "Christian Philosopher" and "Directions for a Candidate of the Ministry" enjoyed high repute. His greatest undertaking was entitled "Illustrations of the Sacred Scriptures." He labored upon it from his 31st year to his death, and the manuscript is now in the library of the Massachusetts historical society. His life was written by his son, Samuel Mather (1729), and again by W. B. O. Peabody in Sparks's "American Biography."

MATHEW, Theobald, "the apostle of temperance," born at Thomastown, county Tipperary, Ireland, Oct. 10, 1790, died Dec. 8, 1856. He was educated in an academy at Kilkenny and the college of Maynooth, and entered a Capuchin convent at Kilkenny, where he remained until after his ordination in 1814, when he was placed in charge of a chapel in Cork. His urbane manners and charitable disposition soon acquired for him an extraordinary influence. He interested himself warmly in the condition of the lower classes, and organized a religious association for visiting the poor and sick, in which he induced numbers of young men to enroll themselves. In 1838 a Quaker first directed his attention to the necessity of suppressing intoxication. Soon afterward he was invited by several teetotallers in Cork to join them in devising a public crusade against drunkenness. A total abstinence society was formed, of which he was unanimously chosen president. Thirty-five persons took the pledge at his hands at once; on the following day several hundreds joined the society, and in the course of five months he administered the pledge at Cork alone

to 150,000 converts. No small part of this success was due to Father Mathew's personal popularity. He was invited to all parts of Ireland. In Limerick the crowds who came to hear him from the furthest parts of Connaught were so large, that but for the liberality of the citizens there would have been a famine in the place. He now gave up everything else to devote his life to the cause of temperance. At Galway he administered the pledge to 100,000 persons in two days, and after visiting every large town in Ireland he went to England, where he was received with the greatest enthusiasm. His benevolent labors had involved him deeply in debt, and although he received from the queen a pension of £800, most of it was applied to paying an insurance on his life for the benefit of his creditors. His brother, a wealthy distiller in Ireland, assisted him until his business was ruined by the progress of the temperance movement. After travelling and lecturing for some time in England with scarcely less success than in his native country, he visited the United States, lecturing in the principal cities, and returned to Ireland in the autumn of 1851. A statue has been erected to him in the city of Cork, and in September, 1874, a movement was in progress in New York for the erection of a similar statue in Central park.

MATHEWS. I. Charles, an English actor, born in London, June 28, 1776, died in Plymouth, June 28, 1835. He was educated at the merchant taylors' school, and subsequently was apprenticed to his father, a bookseller. He gradually imbibed a predilection for the stage, and after appearing at several provincial theatres as an amateur, was engaged as a comedian at the theatre royal, Dublin. Meeting with unjust treatment here both from the manager and the public, he determined to return to his father's business; but on the way to London he accepted an engagement at Swansea, where he performed for some time with success. After acting several years at York, he became a member of the Haymarket company, and on May, 16, 1803, made his debut before a London audience as Jubal in "The Jew." He performed for many years at the principal London theatres; but feeling that the parts assigned to him did not afford fair scope for his talents, he instituted in 1818, in imitation of Foote and Dibdin, a species of entertainment in the form of a monologue, which, under the title of "Mathews at Home," proved very successful. For five successive seasons he drew crowded audiences to the English opera house, where, by his comic songs, recitations, anecdotes of personal adventure, and imitations of well known actors, he greatly enhanced his reputation. In 1822-'3 he made a successful tour in the United States, where he gathered materials for his "Trip to America," which was received with not less favor than his "At Home." He continued both entertainments for more than ten years longer, appearing at intervals on the stage in the regular drama; and in 1834 he re-

turned to America and performed his "Trip." He died soon after his return to England. His powers of mimicry, combined with an expressive countenance, a flexible voice, and keen discernment, gave him a high position on the English stage. His Mawworm, Sir Fretful Plagiary, Morbleu, Monsieur Mallet, Multiple in "The Actor of All Work," &c., were among the most finished and original conceptions of the comic drama. His imitative powers were abundantly displayed in his "At Home," which was written for him by various authors. In private life he was greatly esteemed, and possessed the friendship of Coleridge, Lamb, and other eminent men. His "Memoirs" were published by his widow (4 vols. 12mo, Philadelphia, 1839). **II. Charles**, son of the preceding, also a comedian, born in December, 1803. He was educated as an architect, but subsequently went upon the stage, and has for many years held a prominent place as a light comedian. In connection with his first wife, better known as Madame Vestris, who died in 1857, he was for years manager of the Olympic and Lyceum theatres in London. In 1857-'8 he made a professional tour in the United States, where he married Mrs. Davenport, an actress, known as Lizzie Weston. In 1860 he withdrew for a time from the stage, and gave entertainments similar to those of his father, in which he was assisted by his wife. In 1863 he visited Paris and performed in a French version, made by himself, of one of his own plays. He visited the United States again in 1869 and 1871, going in the interim to Australia, and in 1872 returned to England, where his wife died in 1873.

MATHEWS, Cornelius, an American author, born at Port Chester, N. Y., Oct. 28, 1817. He graduated at the university of New York, and commenced his literary career in 1836 by contributions in prose and verse to various periodicals. In 1839 he published "Behemoth, a Legend of the Mound Builders," in 1840, "The Politicians," a comedy; and in 1841, "The Career of Puffer Hopkins," a novel illustrating various phases of political life in New York. His remaining works comprise "Poems on Man in the Republic" (1843); "Big Abel and Little Manhattan" (1845); "Witchcraft," a tragedy (1846); "Jacob Leisler," a play (1848); "Moneypenny, or the Heart of the World" (1850); "Chanticleer, a Thanksgiving Story" (1850); "A Pen and Ink Panorama of New York City" (1853); "False Pretences," a comedy (1856); and "Indian Fairy Tales" (1868). He has edited various journals and contributed largely to periodicals.

MATHIAS, Thomas James, an English author, born about 1750, died in Naples in 1835. He graduated at Trinity college, Cambridge, in 1774, and several years later received an appointment in the royal household, which he held till 1818, when he retired on a pension. He commenced his literary career by publishing a volume of "Runic Odes" imitated from

the Norse (4to, 1781), and in 1783 produced an "Essay on the Evidence relating to the Poems attributed to Thomas Rowley." In 1794 he published the first part of an anonymous poem, of which three other parts subsequently appeared, entitled "The Pursuits of Literature," remarkable for severe criticisms on literary men and opinions. It was followed by a variety of minor satirical pieces, after which he published an edition of the works of Thomas Gray, with his life and additions (2 vols. 4to, Cambridge, 1814). The latter part of his life was passed at Naples, where he published much in the Italian language and on Italian literature.

MATSUMÆ, or *Matsumai*, a city of Japan, in Yezo, at the mouth of a small river on the S. coast, lat. 41° 30' N., lon. 140° 3' E., about 42 m. S. W. of Hakodate; pop. estimated at 50,000. It was the seat of the daimio Matsudaira Idzu no Kami, and contains a castle, such as is usually found in a daimio's capital. It carries on a thriving trade with Hakodate, and with Awamori on the main island, across the strait of Tsugaru. Next to Hakodate it is the largest town in Yezo. Matsumaë derives its importance in the eyes of foreigners from the fact that here the Russian captain Golovnin was imprisoned from 1811 to 1813. The question of opening Matsumaë as a port of foreign commerce was discussed by Commodore Perry with the Japanese in 1854, but without success. The name Matsumaë was applied by some of the earlier navigators both to the island of Yezo and to the strait of Tsugaru.

MATSYS, *Metsys*, or *Messys*, *Quintin*, a Flemish painter, born in Louvain about 1460, or according to some authorities in Antwerp in 1450, died in Antwerp about 1530. He was brought up as a blacksmith, in which trade he continued until about his 20th year, when, according to the popular story, he became enamored of a painter's daughter, and to win her hand forsook the anvil for the easel. He painted in the hard style of the early Flemish masters, colored highly, and was distinguished for minuteness of finish and force of expression, particularly in religious subjects; although elsewhere he exhibits a cheerful conception of life, and occasionally considerable humor. His chief work is the great altarpiece in the museum at Antwerp, consisting of a centre and two wings; in the former is represented the "Descent from the Cross," of which Sir Joshua Reynolds says: "There are heads in this picture not exceeded by Raphael;" the latter are devoted to incidents in the history of St. John the Baptist and St. John the Evangelist. The artist received but 300 florins for this work; but Philip II. subsequently endeavored in vain to purchase it, and Elizabeth of England is said to have offered 64,000 florins for it. One of his best authenticated works is that in Windsor castle known as "The Misers," of which several repetitions are in existence. The heads are painted in a masterly manner. About 70 pictures are ascribed to him, and these are

widely distributed throughout the chief galleries of Europe, and are highly prized.

MATTEL, *Jacques*, a French philosopher and historian, born at Alt-Eckendorf, Alsace, May 31, 1791, died in Strasburg, June 23, 1864. He was intended for the legal profession, and after studying under private tutors and at the gymnasium of Strasburg and the university of Göttingen, he went to Paris, where he attended the lectures of the faculty of letters, and wrote his *Essai historique sur l'école d'Alexandrie*, which received a prize from the academy in 1816, and was published in 1820. By favor of Royer-Collard and Guizot he received in 1819 a professorship in the college of Strasburg, which he exchanged two years afterward for the direction of the gymnasium and the professorship of ecclesiastical history in the Protestant academy of the same city. He published *Histoire critique du gnosticisme* (2 vols., Paris, 1828), and *Histoire universelle de l'Eglise chrétienne* (3 vols., 1829-'32). In 1828 he was appointed inspector of the academy of Strasburg, and in 1831 corresponding member of the academy of inscriptions. His treatise *De l'influence des mœurs sur les lois et des lois sur les mœurs* (Paris, 1832) received from the academy an extraordinary prize of 10,000 francs. In 1832 he was appointed by Guizot general inspector of the university of Paris; in 1845 he became inspector general of public libraries, and subsequently he devoted himself to literary labors at Strasburg. Among his other works are: *Histoire des doctrines morales et politiques des trois derniers siècles* (3 vols., 1836-'7); *De l'affaiblissement des idées et des études morales* (1841); *Schelling et la philosophie de la nature* (1842); *De l'état moral, politique et littéraire de l'Allemagne* (2 vols., 1847); *Histoire de la philosophie dans ses rapports avec la religion* (1854); *Philosophie de la religion* (2 vols., 1857); *La morale, ou la philosophie des mœurs* (1860); *Saint-Martin, le philosophe inconnu* (1862); and *Emmanuel de Swedenborg* (1863).

MATTERHORN (Fr. *Mont Cervin*; Ital. *Monte Silvio*), a mountain of the Pennine Alps, between the canton of Valais, Switzerland, and the Val d'Aosta, Italy, 14,835 ft. high. It is one of the grandest peaks in the world. In the view from the Riffel its precipices rise 4,000 ft. to a summit which appears like the wall and steep roof of a house. From Breuil, in the Val Tournanche, the whole Italian face is a series of terraced walls. From the north and south the mountain appears like a tower, and from the east and west it has the form of an obelisk. At the height of 11,096 ft. is the pass of Mont Cervin, traversed in summer by mules and horses, and exhibiting the remains of rude fortifications, supposed to have been erected two or three centuries ago as a defence against incursions from the Valais. Up to 1865 the Matterhorn was the last of the great Alpine peaks that remained unscaled. The first attempts to ascend it were made by

guides from the direction of Breuil in 1858 and 1859, and the highest point attained was the "Chimney," about 12,650 ft. In July, 1860, three Englishmen, Alfred, Charles, and Sandbach Parker, of Liverpool, without guides, ascended 12,000 ft. In August Prof. John Tyndall and Vaughan Hawkins accomplished 12,992 ft. In July 1861, the Messrs. Parker made another effort, and reached a few feet beyond the point attained by them the previous year. In August Edward Whymper ascended to the "Chimney." In July, 1862, Tyndall ascended 13,970 ft. In 1863 and 1864 Whymper made unsuccessful attempts to reach the summit. On July 14, 1865, Mr. Whymper, Lord Francis Douglas, the Rev. Charles Hudson,



The Matterhorn, from the Riffel.

Mr. Hadow, and four guides started from Zermatt, and on the day following accomplished the ascent. In descending the Matterhorn the rope connecting the party broke, and Michel Croz, one of the guides, Lord F. Douglas, and Messrs. Hudson and Hadow were plunged down a precipice 4,000 ft. The body of Douglas was never found; the others were buried at Zermatt. Three days later (July 17) a successful ascent was made from Breuil by Jean Antoine Carrel and others. The next ascent was made in August, 1867, by Craufurd Grove. In July, 1868, Mr. Elliott with two guides reached the summit from the north side; and in the same summer Prof. Tyndall was the first to effect the passage of the mountain across the

crest from Breuil to Zermatt. The crest of the Matterhorn is a line of snow, 580 ft. long, and 6 ft. higher toward the east than toward the west. On the eastern face a hut has been built at a height of 12,526 ft., and since 1868 numerous ascents have been made.

MATTEUCCI, Carlo, an Italian savant, born in Forlì, June 21, 1811, died in Leghorn in June, 1868. He studied at Bologna and in Paris, returned to Forlì in 1831, and there began his scientific experiments. He removed to Florence in 1834, and in 1837 became professor of physics and director of the laboratory at Ravenna, and in 1840 professor of physics at Pisa. For his experiments in electro-physiology he took a prize at the French academy of sciences in 1844, and also the Copley medal of the royal society of London. He constructed the first line of telegraph in Tuscany, in 1846, and was made superintendent of the telegraph service. He became a senator in 1848, a member of the council in 1859, and after the establishment of the kingdom of Italy a member of the national senate and inspector general of telegraphs, and in March, 1862, minister of public instruction. His principal works are on the phenomena of electro-physiology (1840), physics, electricity applied to the arts, and the physico-chemical phenomena of living bodies.

MATTHEW, Saint, one of the twelve apostles, and author of the first Gospel. The New Testament tells us little of his personal history. He was a son of Alphaeus, and a receiver of customs at the lake of Tiberias. Jesus, while passing one day, said to him: "Follow me;" and Matthew at once obeyed. Most exegetical writers assume that the publican Levi, whose call to the discipleship is recorded by Mark and Luke, is the same person as Matthew; but among the opponents of this view are Origen, Grotius, Michaelis, and Ewald. After the ascension of Christ, Matthew was at Jerusalem, with the other apostles. Then history loses sight of him. Tradition relates that he preached the gospel for 15 years in Jerusalem, and then turned to other nations. Among these are mentioned the Ethiopians, Macedonians, Syrians, Persians, Parthians, and Medes. He is said to have been burned alive in Arabia Felix; and according to Baronius, his body was brought to Palermo in 954. The Roman Catholic church keeps his festival on Sept. 21, the Greek on Nov. 16.—The Gospel of Matthew, according to the unanimous tradition of the ancient church, was composed in Hebrew, or rather the Syro-Chaldaic idiom spoken at that time in Palestine. Following Erasmus, many eminent Protestant theologians, as Calvin, Beza, Lightfoot, Credner, De Wette, Ewald, Harless, Bleek, Schenkel, Keim, and Volkmar, and among Roman Catholics Hug, have contested the correctness of this tradition, and advocated the originality of the Greek text; but the opposite theory has also found defenders, prominent among whom are Meyer and Lange. A considerable number of distinguished theo-

logians, as Lachmann, Credner, Ewald, Reuss, Meyer, Bleek, Bunsen, Schenkel, Keim, and generally all the theologians of the Tübingen school, infer from a passage of the early ecclesiastical writer Papias, that Matthew himself compiled only a summary of the sermons and sayings of Christ, which was put into historical form by another writer. But weighty authorities have since shown that this passage of Papias admits of another interpretation. The Gospel was undoubtedly written for Christians of Jewish descent in Palestine. With respect to its date ecclesiastical traditions vary from A. D. 41 to 67; a majority of modern writers seem to agree in fixing it between 60 and 67. The chief aim of this Gospel is evidently to prove the Messianic character of Jesus. For its relation to the Gospels of Mark and Luke, see MARK; for collective commentaries on all the four, or the first three Gospels, see LUKE.—See Sieffert, *Ueber die Echtheit und den Ursprung des ersten canonischen Evangeliums* (1832); Schneckenburger, *Ueber den Ursprung des ersten Evangelii* (1834); Schott, *Ueber die Authenticität des canonischen Evangeliums nach Matthäus benannt* (1837); Kern, *Ueber den Ursprung des Evangeliums Matthäi* (1837); and Holtzmann, *Die synoptischen Evangelien* (1863).

MATTHEW PARIS, or **Matthew of Paris** (Lat. *Matthæus Parisiensis*, so called from his having studied in that city), an English historian, born about 1195, died in 1259. From 1217 he was a Benedictine monk of St. Albans, where he continued the *Flores Historiarum* of Roger of Wendover from 1235 to 1259, adding a nearly equal amount of his own to the original. This, known as the *Historia Major*, was first printed by Archbishop Parker in 1571, and an edition by Dr. William Watts (fol., London, 1640; Paris, 1644). Matthew Paris made a compilation from it, extending from 1066 to 1253, known as the *Historia Minor*, the *Chronicon*, and the *Liber Chronicorum*, which Sir Frederick Madden published under the title *Historia Anglorum* (London, 1866), from the original in the British museum. An original manuscript of the *Flores Historiarum*, discovered in the Chetham library at Manchester, according to Sir Francis Madden, settles beyond doubt that the largest portion of that work, attributed to "the pseudo Matthew of Westminster," was written at St. Albans, under the eye of Matthew Paris, as an abridgment of his "Greater Chronicle," and the text from the close of 1241 to 1249 is in his own handwriting. It was continued by monks of St. Albans to 1265, and to 1825 at Westminster, whence the name Matthew of Westminster, otherwise unknown, became attached to it. The *Historia Major* has been translated into English by the Rev. J. A. Giles (5 vols. 8vo, London, 1849-'54), and the *Flores Historiarum* by C. D. Yonge (2 vols. 8vo, 1853).

MATTHEWS, an E. county of Virginia, bordering on Chesapeake bay; area, 68 sq. m.;

pop. in 1870, 6,200, of whom 2,096 were colored. It is a peninsula, having the Piankatank river on the N., the Chesapeake on the E., and Mobjack bay on the S. W., and is connected with the mainland by an isthmus 1 m. wide; length 20 m., greatest width 8 m. It has a level surface and moderately fertile soil. The chief productions in 1870 were 3,268 bushels of wheat, 104,867 of Indian corn, and 13,577 of oats. There were 390 horses, 2,269 cattle, 957 sheep, and 4,055 swine. Capital, Matthews.

MATTHIAS, a religious impostor, whose real name was ROBERT MATTHEWS, born in Washington co., N. Y., about 1790, died in Arkansas. He kept a country store, failed in 1816, and went to reside in New York. In 1827 he removed to Albany, where he became excited by the preaching of the Rev. Messrs. Kirk and Finney. He engaged in the temperance cause, and, claiming to have received a revelation, took to street preaching. Failing to convert Albany, he prophesied its destruction and fled to New York, where he involved several respectable families in his delusions, and was tried and acquitted on a charge of poisoning a wealthy disciple in whose family he lived. His impositions having been exposed, he disappeared.—See "Matthias and his Imposture," by W. L. Stone (New York, 1835).

MATTHIAS, emperor of Germany, born Feb. 24, 1557, died March 20, 1619. His mother was a daughter of the emperor Charles V. His father was Maximilian II., who died in 1576, and was succeeded by his eldest son Rudolph II., whose jealousy of his brother's participation in affairs at home had early impelled Matthias to espouse the cause of the revolted Netherlanders; and he was their nominal ruler from 1577 to 1580, when he withdrew before the superior influence of the prince of Orange. The death of his brother Ernest, archduke of Austria (1595), brought him into prominence, Rudolph intrusting him with the administration of that archduchy. He was notorious for his persecution of the Protestants. Commissioned by the emperor, he restored tranquillity in 1606 among the Hungarians, who had invoked the aid of Bocskay of Transylvania and of the Turks against the house of Hapsburg; and in 1608, having formed a confederation of the Hungarian, Moravian, and Silesian estates, he forced Rudolph to cede to him Hungary, Moravia, and Austria, and to secure to him the succession to the kingdom of Bohemia. He now sought to propitiate the Protestants in order to obtain this concession; and subsequently, when Rudolph manifested a preference for the archduke Leopold as future king of Bohemia, Matthias joined the disaffected Bohemians against his brother, and secured from him the cession not only of Bohemia, but also of Silesia and Lusatia. His brother leaving no issue, Matthias was unanimously elected (June, 1612) to succeed him as emperor. He was unable to grapple with the Turks in Hungary, whose advance on Vienna was only arrested by

his suing for peace in 1615. He was equally unfortunate in his attempts to arrest the religious strife to which he had not a little contributed by countenancing his brother's support of the Jesuits. After failing to transfer the Catholic league (formed in 1609) from Bavarian to Austrian control, he issued a decree (April, 1617) against this as well as the rival Protestant association established in 1608 under the lead of the count palatine Frederick IV. Both disregarded his decree, and his failing health offered a convenient pretext for substituting the archduke Ferdinand as king of Bohemia (1617) and Hungary (1618). But the bigotry of this prince (the future emperor Ferdinand II.) resulted in the outbreak in Prague (May 23, 1618), which kindled the flames of the thirty years' war. His death took place at a time when the revolted Bohemians had gained considerable advantages.

MATTHIAS I., the Great, surnamed **CORVINUS**, king of Hungary, born in 1443, died in Vienna in 1490. He was a son of John Hunyady (Hunniades), the governor of Hungary during the minority of King Ladislas the Posthumous. His elder brother Ladislas perished on the scaffold by order of that king, but he succeeded the latter on the throne by election in 1458, after having been previously detained as a prisoner in Bohemia by the adversaries of his house. He met with bitter opposition on the part of many powerful nobles, who in 1459 elected the emperor Frederick III. as rival king. Matthias, however, prevailed upon Frederick to surrender to him the crown of St. Stephen; and he next expelled the Turks, who had availed themselves of the intestine troubles to invade the country. He restored order in the kingdom with a firm hand, curbing the license of the nobles with rigor. He had married a daughter of George Podiebrad, king of Bohemia, but was induced by ambition and the entreaties of the court of Rome to fight his own father-in-law, who had been excommunicated as a Hussite in 1463, and afterward declared deposed by the new pope Paul II., a crusade being preached against him throughout the German empire. Podiebrad repulsed the invasion of Bohemia by Matthias, and concluded an armistice with him in April, 1469; but the latter, being chosen king of Bohemia by a mock diet at Olmütz, without effect, renewed hostilities, which did not terminate till July, 1470. In the mean time Matthias had wrested from Podiebrad Moravia, Silesia, and Lusatia (1468-'70); he also vanquished the Poles, and in 1485-'6 wrested Vienna and a large part of Lower Austria from the emperor Frederick. The enormous expenses of these wars entailed heavy burdens upon his subjects; but his rule, though arbitrary, was so eminently judicious and popular that after his death the adage gained currency: "King Matthias gone, justice gone." Hungary enjoyed under his influence an era of unprecedented prosperity and prestige in Europe as the great bulwark against the Turks.

At the same time he promoted letters and science more thoroughly than any other potentate of his day. He gathered round him learned Italians, founded the university of Buda, acquired Greek manuscripts, and employed numerous copyists at Florence and Buda to add valuable materials to the royal library. Its partial destruction by the Turks in 1527 was a great calamity, especially as only a small portion of it found its way to Vienna.—John Corvinus, a natural son of Matthias, attempted to succeed to the throne, which was occupied after the latter's death by Uladislav II.

MATTHIAS, John. See **ANABAPTISTS**.

MATTHISSON, Friedrich von, a German lyric poet, born near Magdeburg, Jan. 23, 1761, died near Dessau, March 12, 1831. Having developed considerable talents as a poet, and gained great popularity, he was patronized by various German princes, but retired from court life in 1824. His "Elegy in the Ruins of an Old Castle" is one of his finest lyrics. He edited selections from the lyric poets of Germany under the title of *Lyrische Anthologie* (20 vols., Zürich, 1803-'7). His *Erinnerungen und Schriften* were published at Zürich (5 vols., 1810-'16, and 8 vols., 1825-'31), and his posthumous works at Berlin (4 vols., 1832).

MATTISON, Hiram, an American clergyman, born in Norway, N. Y., Feb. 11, 1811, died in Jersey City, N. J., Nov. 24, 1868. He entered the Methodist ministry in 1835, and in 1836 joined the Black River conference. In 1841 he was appointed agent of the American Bible society for the state of New Jersey. Resuming the pastorate in 1842, he was successively stationed at Watertown and Rome, N. Y. From 1846 to 1860 he was chiefly employed in the preparation of works on astronomy, in lecturing, and in supplying the John street church, New York; but in 1856-'7 he was pastor at Adams and Syracuse, and took a leading part in the anti-slavery movement. In 1859, by correspondence with the Methodists of Great Britain, he obtained the names of about 85,000 petitioners to the general conference of 1860, praying that body to extirpate slavery from the Methodist Episcopal church; and a like paper from 45,000 petitioners in central New York was largely due to his efforts. In November, 1861, he withdrew from the Methodist Episcopal church, because, as he affirmed, of its toleration of slaveholding; and soon after he became pastor of St. John's Independent Methodist church, New York. In 1865 he returned to the former church, and was stationed at Jersey City, where he was prominent in his opposition to the claims of the Roman Catholic church. This led to his appointment in 1868 as one of the district secretaries of the American and foreign Christian union. Among his works are: "The Trinity and Modern Arianism," and "Tracts for the Times" (1843); "Elementary Astronomy, accompanied by Maps" (1846); "Burritt's Geography of the Heavens," edited and revised (1850); "High

School Astronomy" (1853); "Spirit Rapping Unveiled" (1854); "Sacred Melodies," and "Impending Crisis" (1859); "Immortality of the Soul," "Resurrection of the Body," and "Defence of American Methodism" (1866); and "Popular Amusements" (1867).

MATTO GROSSO (Port., thick brushwood), a province of Brazil, bounded N. W. and N. by Amazonas and Grão Pará, E. and S. E. by Go-yaz, São Paulo, and Paraná, S. by Paraguay, and S. W. and W. by Bolivia; area, 551,575 sq. m.; pop. about 100,000. This province, the largest in the empire after Amazonas, forms the western portion of the highlands of Brazil, comprising the Amazon-Paraguay watershed, which is so low that canoes ascending the Tapajós from Santarém are crossed over and floated on the Paraguay to descend to Villa Maria. From the transversal ridge forming the watershed just referred to are several minor chains stretching N. and S., separated by deep valleys and immense plains covered with dense forests, which give the name to the province, and afford inexhaustible quantities of timber suited for every species of construction, and a great variety of precious cabinet woods. The Tapajós and Xingú rivers rise in the central portion and flow N. to the Amazon, while the Paraguay flows southward, forming part of the S. W. boundary line, and all receive the waters of innumerable streams, which elsewhere would rank as grand rivers. The Guaporé or Iténez forms with the Madeira almost the whole of the remainder of the western boundary; and the eastern and southern boundaries are constituted by the Araguay and Paraná respectively. Gold is found in nearly every direction; but the mines, like those of diamonds, once extensively worked, especially in the region surrounding Cuyabá, are now mostly abandoned owing to the cost of working them, as the gems and the gold no longer occur near the surface. Copper, iron, and many other metals abound in the hills. The soil is extremely fertile, and the chief occupations of the inhabitants are agriculture and cattle raising. The principal commodities exported are hides, ipecacuanha and other drugs, and balsams, all of which are sent to Rio de Janeiro by caravans of mules. Millet, rice, and manioc are cultivated, as are also sugar, tobacco, and cotton. The chief impediment to colonization is the absence of adequate means of transport to the centres of consumption and the seacoast. Capital, Cuyabá.

MATURIN, Charles Robert, an Irish author, born in Dublin in 1782, died there, Oct. 30, 1824. He was educated at Trinity college, Dublin, took orders, and became curate of St. Peter's in his native city. In 1807 he published "The Fatal Revenge, or the Family of Montorio," a novel, which was followed by several other romantic fictions, as "The Milesian Chief," "The Wild Irish Boy," "Women, or Pour et Centre," and "Melmoth the Wanderer." In 1816 his tragedy of "Bertram" was

accepted at Drury Lane theatre, through the influence of Lord Byron. He was noted for eloquence in the pulpit.—His son EDWARD emigrated to America, where he published several poems and tales, among which are: "Montezuma, the Last of the Aztecs;" "Benjamin, the Jew of Granada;" "Eva, or Isles of Life and Death" (1848); and "Bianca, a Tale of Erin and Italy" (1853).

MAUBEUGE, a fortified town of France, in the department of Le Nord, on the Sambre, 46 m. S. E. of Lille; pop. in 1866, 10,877. It is well built, and has long been important in a military point of view. Its fortifications were reconstructed by Vauban in 1680. After the battle of Waterloo it was captured by the Prussians. It has iron founderies, tanneries, salt refineries, and marble works.

MAUCH CHUNK, a borough and the capital of Carbon co., Pennsylvania, on the W. bank of the Lehigh river, at its passage through the Mahoning mountain, on both sides of the mouth of Mauch Chunk creek, 46 m. above the entrance of the Lehigh into Delaware river, and on the Lehigh canal and the Lehigh Valley railroad and the Central railroad of New Jersey, 89 m. by railroad N. N. W. of Philadelphia, and 121 m. W. of New York; pop. in 1870, 3,841. It is built chiefly in the valley of the creek, on a single street, between the Mahoning and Sharp mountains, in so contracted a place that little room is afforded for gardens to the houses. The hills on each side rise precipitously to the height of several hundred feet, and not far back attain an elevation of more than 1,000 ft. above the river. The place derives its importance from the mines of anthracite found in the Sharp mountain at this eastern extremity of the southern anthracite field of Pennsylvania. The mines of Summit hill or Sharp mountain, 9 m. W. of the village, up the valley of Mauch Chunk creek, have been famous as among the oldest known and most productive of the coal mines in the state. One bed more than 50 ft. thick has been worked over many acres. The coal from these mines was formerly taken to Mauch Chunk over the famous "Switch-back" gravity railroad, and thence transferred by chutes to the Lehigh canal. The cars run by gravity the whole distance to Mauch Chunk, and were formerly drawn back by mules, which made the descent in cars provided for them. But a return track is now laid, along which the cars descend from the chutes at the canal to the foot of Mt. Pisgah, the high point of Sharp mountain next the river, and are then raised to its summit up an inclined plane by a stationary steam engine. From this point they then run 6 m. by gravity to the foot of another inclined plane, up which they are raised as before, and from its summit descend to the different mines. This road has been superseded by a tunnel at Nesquehoning, and it is now only used for pleasure excursions. The Lehigh canal, with the slackwater navigation of the Lehigh, was formerly continued 25 m. further

up the river to Whiteshaven, but having been destroyed by a flood it is now abandoned above Mauch Chunk. The coal mines and furnaces in the vicinity and the Lehigh Valley railroad are controlled largely by residents of the borough. It contains several handsome houses, a fine public school house, court house, jail, two foundries and machine shops, a flour mill, two national banks, a private bank, two weekly newspapers, a library, and five churches. The beauty of the scenery, the coolness and purity of the air, and the excellence of the water have rendered it a famous summer resort. Glen Onoko, near the borough, a wild and beautiful ravine, is a prominent attraction. The borough limits being circumscribed, the

lege, consulting physician to the West London hospital, and editor of the "Journal of Mental Science." His principal works are: "Physiology and Pathology of Mind" (London, 1867); "The Gulstonian Lectures on Body and Mind" (London, 1870); and "Responsibility in Mental Disease," written for the "International Scientific Series" (London and New York, 1874).

MAUI, the second in size of the Hawaiian islands, in lat. 21° N., lon. $156^{\circ} 30'$ W.; length 50 m., greatest breadth 27 m.; area, 603 sq. m.; pop. in 1872, 12,334. It is of volcanic formation, and consists of two mountains connected by an isthmus. East Maui is the larger. Its chief summit, Hale-a-ka-la ("house of the sun"), is 10,200 ft. high, and contains a crater

27 m. in circumference and 2,000 ft. deep. Abundant undecomposed lavas are found in it, but no tradition remains of its activity. The mountain is very regular in its slopes, which vary from 8° to 10° , and are the steeper on the windward or N. E. side, where they are cut up into deep ravines and worn away by the action of the strong trade winds and the rain. West Maui is of still older formation. There is no summit crater; it has a more broken surface and a deeper soil, and the degradation is more extensive. Its highest peak is about 6,000 ft. The connecting isthmus is a low sandy plain, rising but a few feet above the sea; vessels have run upon it by night, supposing a passage to exist. Sugar culture is the chief industry of Maui. The soil, with proper treatment, appears to be inexhaustible, and there is no danger of frost.



Mauch Chunk.

population has extended to Upper Mauch Chunk, on a plateau above the town, and to East Mauch Chunk, a borough on the E. bank of the Lehigh, having 1,585 inhabitants in 1870. The population of the township of Mauch Chunk, on both banks of the river, exclusive of the boroughs, was 5,210. The name is of Indian origin, and its meaning is said to be Great Bear.

MAUDSLEY, Henry, an English physiologist, born near Settle, Yorkshire, in 1835. He studied medicine at University college, London, and received the degree of M. D. in 1856. He became resident physician of the Manchester lunatic hospital in 1859, which post he retained till 1862, when he commenced a consulting practice in London. He is now (1875) professor of medical jurisprudence in University col-

The custom of the planters is to take off two crops and then let the field lie fallow for two years; four tons of sugar to the acre is not an uncommon yield. The cane matures, according to the altitude, in from 14 to 24 months. Owing to bad management, however, the plantations are often unsuccessful. The principal town is Lahaina, on West Maui; pop. 3,002.

MAULE, a S. province of Chili, bounded N. by Talca, E. by the Andes, S. by Nuble and Concepcion, and W. by the Pacific; area, 6,424 sq. m., or according to a Chilian authority, about 8,100 sq. m.; pop. in 1870, 211,567. The surface to the east is roughened by numerous hills; to the west it is traversed from N. to S. by the coast mountains; and in the centre it is a magnificent champagne coun-

try, highly cultivated, and affording excellent pasturage for numerous cattle. The Maule, which rises in a lagoon near the base of the Descabezado peak, and forms the boundary line with Talca, is a considerable river, but is only navigable 30 m. for small vessels, on account of its numerous rapids and a bar at its mouth. Many irrigating canals branch from it, and flour mills abound along its banks. The Itata and Perquilanquen separate the province respectively from Concepcion and Nuble. There are several smaller rivers and numerous mountain torrents. The climate is temperate. The hilly region is for the most part covered with forests, yielding among others a species of timber eminently adapted for ship building, being remarkably strong and durable; and many ships are built along the coast. The principal productions are wheat, barley, maize, garden vegetables, &c., which, with good wines, cheese, and salt, are sent in large quantities to the neighboring provinces, but especially to Valparaiso, between which port and that of Constitucion an extensive coasting trade is carried on. Gold mining, which was active in the last century, has nearly ceased. There are many mineral springs. The province is divided into the departments of Cauquenes, Constitucion, Itata, Linares, and Parral. The capital is Cauquenes, and the ports are Constitucion (the largest) on the Maule, Curanipe, and Huechupureo. A line of railway across the province, from Curicó to Chillan, is in course of construction (1874).

MAULMAIN, or **Moulmein**, a port of Tenasserim, on the E. side of the bay of Bengal, at the mouth of the Salwen, on a small peninsula formed by that river and the Gyne and Attaran, and nearly opposite the Burmese town of Martaban; lat. $16^{\circ} 30' N.$, lon. $97^{\circ} 37' E.$; pop. about 50,000. The banks of the Salwen are lined with jungle from its mouth to the town, and the horizon is bounded, at the distance of from 1 to 6 m., by hills parallel with the stream, covered with trees to their summits. The native houses are raised on piles, 10 or 12 ft. from the ground, and are formed of mats and palm leaves. The houses of the Europeans and those of the wealthier Burmans are built entirely of wood, also raised upon piles. There are a few scattered brick buildings. The native town consists of one long street, which runs for nearly 4 m. along the bank of the Salwen, and a few others which branch from it toward the heights on the east and connect it with the European houses. There are several wooden jetties along the shore. The inhabitants consist of Burmans, Talains, Chinese, Bengalese, and Madrasese, with a few Armenians, Jews, and Cingalese. A considerable number of Europeans are settled there, and a few missionaries. There are seven Christian churches, five of which are Protestant. Maulmain is a place of considerable trade, principally with Calcutta, Madras, Rangoon, and Penang. The exports consist chiefly of timber, ivory, wax,

stick lac, caoutchouc, cajeput oil, gum resins, nut oil, sandal wood, dammar, tanning substances and dyes, aloes, and sapan wood. With the exception of timber, all the articles used in ship building are imported, besides cotton cloth, coarse earthenware, sugar, tobacco, arms, and gunpowder. The forests in the immediate neighborhood yield an abundant supply of teak timber, and ship building is successfully carried on. When the Tenasserim provinces were ceded by the Burmese to the British in 1826, the site upon which Maulmain stands was covered with jungle overrun by tigers. The heat is not so oppressive as on the coast of Cooromandel, the thermometer seldom rising above 90° in the shade.

MAUNA KEA, the highest mountain in the Hawaiian islands and in Polynesia; elevation, as estimated by the United States exploring expedition, 13,953 ft. It occupies the northern and central parts of Hawaii, and is a dome of volcanic formation, with terminal craters that have long been extinct. Though steeper and apparently rougher in surface than Manna Loa, it is easier to ascend, owing to the greater degradation of the lavas which form its slope. Snow rests upon it during the greater part of the year. The terminal peaks are truncated cones of gravel and reddish scoria; the angle of their outer slope is about 30° . Herds of wild cattle roam in the forests that cover the flanks of the mountain, and are hunted for the sake of their horns, hides, and tallow.

MAUNA LOA ("long or high mountain"), a volcanic mountain occupying a large part of the central and southern regions of the island of Hawaii; elevation, 13,760 ft. It is entirely composed of lavas which have been thrown out in a highly fluid state, and which in consequence have flowed laterally with such freedom as to build up a mountain with extremely gentle slopes, averaging, according to Prof. Dana, but $6^{\circ} 30'$; the declivity upon the E. side is somewhat the steepest. It presents the appearance of a smooth, regular dome, usually crowned with snow, and partially forest-clad. On the east the forests cease at the elevation of 5,000 ft. Vegetation reaches to the height of 7,000 and 10,000 ft. on the leeward and windward sides respectively. The surface of Mauna Loa is composed of recent lavas in three forms: 1, the *pahoehoi* or "satin lava," a dense and solid rock; 2, scoriaceous lava, or "clinkers;" 3, a black slag or spongy lava, of the horrible roughness and hardness of which it is difficult to convey any idea. Its craters are numerous, occurring near the summit and on the sides; new ones sometimes open, and are the source of the grandest of the Hawaiian eruptions. The terminal crater, Mokuawe-weo, is circular, 8,000 ft. in diameter, with two lateral depressions which increase its dimensions in the N. and S. direction to 13,000 ft. It was about 1,000 ft. deep in 1864, with nearly perpendicular walls. Eruptions from Mauna Loa often take the form of enormous lava

fountains, spouting continuously from the top of the mountain. In February, 1859, such a fountain played actively for four or five days, throwing up a sheaf of white-hot fluid lava about 200 ft. in diameter, and 200 or 300 ft. high, illuminating the horizon at a distance of 150 m. In April, 1868, the lavas forced their way 20 m. under ground, and appeared near the S. point of the island, bursting forth through a fissure 2 m. long, which ran N. and S. On the 10th Mr. H. M. Whitney observed four enormous lava fountains continuously spouting up from this opening. Two of them occasionally united laterally; and sometimes the whole four joined in one, making a continuous fountain a mile long. It boiled with the most terrific fury, throwing up enormous columns of crimson lava and red-hot rock to the height of 500 or 600 ft. The lava was ejected with a rotary motion, uniformly toward the south. Mauna Loa has been seen at sea from a distance of 53 leagues; "the most striking example I have yet known," says Humboldt, "of the visibility of a mountain."

MAUNDY THURSDAY. See HOLY WEEK.

MAUPERTUIS, Pierre Louis Moreau de, a French astronomer, born in St. Malo, July 17, 1698, died in Basel, July 27, 1759. He was five years in the army, but he resigned in 1723, and was admitted into the academy of sciences. His ability in opposing the physical theory of Descartes, and substituting for it that of Newton, gained him admission in 1727 into the royal society of London. The controversy had excited public interest, when the French government resolved to verify one of the hypotheses of the British philosopher, that of the flattening of the terrestrial globe near the poles. Maupertuis was at the head of a commission of academicians, including Clairaut and Lemonnier, which in 1736-'7 measured an arc of a meridian in Lapland; and the result, confirming the conjecture of Newton, gave him distinction throughout Europe. He was invited by Frederick the Great to Berlin, where he became president of the academy, married a lady of a distinguished family, and received large pensions. In 1750 he became involved in a controversy with König, who disputed one of the principles of Maupertuis and maintained that it was a plagiarism from Leibnitz. The latter years of his life were afflicted by illness.

MAUR, Congregation of St. See SAINT-MAUR.

MAUREPAS, Jean Frédéric Phélypeaux, count, a French statesman, born July 9, 1701, died Nov. 21, 1781. He was grandson of the chancellor Pontchartrain, and at the age of 14 succeeded his father as secretary of state, the administration of the office being intrusted to the marquis de La Vrillière till 1725, when he became the acting minister. He discharged the duties of this office till 1749, embellished the capital, sent La Condamine, Bouguer, and others to measure an arc of the meridian in Peru, near the equator, and Maupertuis, Clairaut, and others to measure an arc in Lap-

land. He also promoted the expeditions of Fourmont to Greece and the Orient, and of Jussieu to Peru. An epigram which he wrote upon Mme. de Pompadour caused his banishment from court for 25 years. He was recalled by Louis XVI., again became president of the council of state, restored the exiled parliaments, called Turgot and Necker successively into the ministry, but by his fickle and frivolous administration hastened the catastrophe of the French revolution. The *Mémoires du comte de Maurepas* was published by the abbé Soulavie (4 vols., Paris, 1792).

MAURER. I. Georg Ludwig von, a German jurist, born at Erpolsheim, Rhenish Bavaria, Nov. 2, 1790, died in Munich, May 9, 1872. He took his degree at Heidelberg in 1812, and studied in Paris till 1814. He was subsequently assistant attorney general in various places till 1826, when he became professor at the university of Munich. Having been made councillor of state, he was from 1832 to 1834 a member of the regency in Athens, Greece, and distinguished himself by drawing up most of the codes of law. In 1847 he was for a short time minister of foreign affairs and of justice. Among his numerous works are *Das griechische Volk* (3 vols., Heidelberg, 1836), and *Geschichte der Städteverfassung in Deutschland* (4 vols., Erlangen, 1869-'71). **II. Konrad**, a German author, son of the preceding, born at Frankenthal in 1823. In 1847 he became professor of jurisprudence at Heidelberg. He is a high authority on early Scandinavian history, laws, languages, and literature. His principal works are: *Die Entstehung des isländischen Staats und seiner Verfassung* (Munich, 1852); *Die Bekehrung des norwegischen Stammes zum Christenthum* (2 vols., 1855-'6); an edition of the Icelandic *Gullthóris-saga* (Leipsic, 1858); and *Isländische Volksagen der Gegenwart* (1860).

MAURETANIA. See MAURITANIA.

MAURICE, count of Nassau and prince of Orange, stadtholder of the United Dutch Provinces, born at Dillenburg, Nov. 14, 1567, died at the Hague, April 23, 1625. He was the second surviving son of William I. of Orange, surnamed the Silent, by Anna, the daughter of Maurice of Saxony. Maurice of Nassau was in his 17th year when his father was assassinated (1584), and was soon after proclaimed governor and captain general by the states of Holland and Zealand, his elder brother Philip William having been carried by the duke of Alva to Spain. Maurice, though commencing his military career under the control of the count of Hohenlohe, was elected by the states in 1587 governor and commander-in-chief of the republic, during the temporary absence of Leicester; and after the recall of Leicester by Queen Elizabeth he was acknowledged as stadtholder and commander-in-chief by all the provinces, Lord Willoughby commanding the English auxiliary forces. Opposed to the greatest captain of that period; Alessandro Farnese, Maurice

surprised and captured Breda (1590), and in the following year took Zutphen, Deventer, Nimeguen, and other places. The conquest of Gertruidenberg (1593) and Groningen (1594), after protracted sieges, manifested still more clearly his abilities; and his camp soon became, like that of the duke of Parma, who died in 1592, one of the great schools of the military art, to which warlike youth flocked from every Protestant country. In these and many subsequent conquests, Maurice was assisted by the English auxiliary troops under Sir Francis Vere, and he was still more indebted to the aid of the latter in his first battle in the open field, before Turnhout in Brabant, where he routed the Spaniards and compelled the fortress to surrender (1597). In 1598 Albert of Austria, governor of the Netherlands in right of his wife Isabella, on whom the sovereignty had been bestowed by her father Philip II., demanded from the United Provinces a voluntary submission to their new rulers. The republic answered only by a more vigorous prosecution of the war by land and sea. Maurice routed the archduke at Nieupoort near Ostend (1600), the issue of the battle being long disputed, and the English under Sir Francis Vere claiming the principal honor of the victory. The Protestant army, however, was exhausted, and Albert was allowed to resume the field with superior forces, and to commence the siege of Ostend, while Maurice successively laid siege to other places. The resistance of Ostend lasted more than three years; but when the Italian Spinola took the command of the besieging army, all efforts to save the fortress proved vain, and an honorable capitulation ended the struggle, which had cost the king of Spain 80,000 men. Maurice had in the mean while achieved numerous conquests, which more than balanced the loss of Ostend, and the Dutch colonial possessions had been much extended, largely at the expense of Spain and Portugal. Spinola himself advising peace, Philip III. finally yielded, and a truce for 12 years was concluded at the Hague (1609), under which the Dutch retained their liberty and conquests. This termination of the struggle was owing chiefly to the diplomacy of Barneveldt, Maurice resisting it to the last. Bent on usurping supreme power, Maurice was ready to sacrifice the interests of his country in order to retain his command; and when checked by the energy of the veteran statesman, he eagerly sought for his destruction. Maurice flattered and excited the passions of the Gomarists, while Barneveldt adhered to the Arminians. The synod of Dort was convoked (1618), a mock trial was held, and Barneveldt perished on the scaffold (1619). Grotius and others were thrown into prison. A son of Barneveldt, who undertook to avenge his father, was executed. But the people punished Maurice by unconcealed detestation, and he entirely lost the fruit of his crimes. Only the renewal of the war after the expiration of the truce

(1621) restored him to popularity. He compelled Spinola to raise the siege of Bergen-op-Zoom (1622), for the conquest of which he had sacrificed 10,000 of his best troops, but was unable to rescue Breda, his grief on the fall of which (1625) is believed to have caused his death. His elder brother having died, as restored prince of Orange, in 1618, the younger, Frederick Henry, succeeded as stadtholder.—See Motley, "History of the United Netherlands" (1860-'67), and "Life and Death of John of Barneveldt" (1874).

MAURICE, duke and elector of Saxony, a German general, born in Freiberg, March 21, 1521, died at Sievershausen, near Lüneburg, July 11, 1553. He received a brilliant education, and joined the Protestant church in 1539. In 1541 he married a daughter of the landgrave Philip of Hesse, and in the same year (Aug. 18) succeeded his father Henry the Pious on the ducal throne. In 1542 he fought in the army of the emperor Charles V. against the Turks, and in 1543 against the French. He aided the emperor in defeating the Smalcald league at the battle of Mühlberg (April 24, 1547), although his father-in-law was one of the two principal leaders of the league. The other leader was his cousin John Frederick of the Ernestine line of the house of Saxony, with whom he had previously quarrelled, and whose dominions were now added to his own, with the rank of elector conferred upon him by the emperor (July 1, 1547). The landgrave of Hesse was at the same time treacherously arrested at Halle, and other arbitrary measures soon alienated Maurice from the emperor and caused him to originate a bold scheme, which with one stroke of his sword cut the knot that imperilled the reformation and the liberties of Germany. He availed himself in 1550 of the commission given him to enforce the imperial ban against the disaffected city of Magdeburg to make military preparations, and concluded a secret treaty with Henry II. of France at Friedewalde, Oct. 5, 1551. Before throwing off his mask, he once more demanded the liberation of his father-in-law, which was refused by Charles V. He now marched on Innspruck, where Charles was lying very sick with gout, and suddenly made his appearance before that city in May, 1552, while the French occupied the emperor's possessions in Lorraine. Charles narrowly escaped capture by hasty flight, and was obliged to restore to liberty both the cousin and the father-in-law of Maurice, and to grant by the treaty of Passau (Aug. 2, 1552) the fullest religious liberty to the Protestants, upon which Maurice had insisted as the condition of peace. Subsequently he joined the emperor and his brother King Ferdinand in a new campaign against the Turks, and behaved with his wonted gallantry, but without achieving any decided success. Early in 1553 he joined the league against the margrave Albert of Brandenburg, who would not recognize the treaty of Passau. Maurice achieved a brilliant victory over him at Sievers-

hansen (July 9), but received a wound from which he died two days afterward. In 1853 a monument was erected on the battle field in his honor. He promoted important civil, military, and educational reforms in Saxony, and added several institutions to the university of Leipsic. He was succeeded by his brother Augustus. His only surviving daughter, Anna, became the wife of William I., prince of Orange.—See *Moritz, Herzog und Kurfürst von Sachsen*, by Langenn (2 vols., Leipsic, 1841).

MAURICE, John Frederick Denison, an English clergyman, born in 1805, died in London, April 1, 1872. He was the son of a Unitarian minister, and was sent at an early age to Trinity college, Cambridge, where he contracted a friendship with John Sterling, and they married sisters. He declined a fellowship on the ground that, being a dissenter, he could not sign the thirty-nine articles of the church of England, and take a degree. Going with Sterling to London, he became connected with the "Athenæum," and published a novel entitled "Eustace Conyers, or Brother and Sister." It was not put in circulation till 1834, when the publisher had quite lost sight of the author. The villain of the novel was called Capt. Marryat; and Mr. Maurice received a challenge from Capt. Frederick Marryat, whose astonishment was great on learning that the anonymous author of "Eustace Conyers" had never heard of the author of "Frank Mildmay," and, being in holy orders, was obliged to decline fighting a duel. At the end of two years he became a member of the church of England, and a candidate for holy orders, and about 1828 received ordination. Endeavoring to make the theology of his church minister to the social wants of the people, he pursued a career of activity and usefulness in that direction, although he encountered much opposition. Allying himself from the outset with that movement in the established church now known as the "Broad Church" party, of which Dr. Arnold of Rugby was the acknowledged pioneer, he was after the death of the latter commonly regarded as his successor in its leadership. His personal influence secured many adherents; and his numerous writings, nearly all of which were devoted to the exposition of "Broad Church" views, were widely circulated in Great Britain and America. Not less remarkable was his advocacy of "Christian socialism," in which he found an able and enthusiastic colleague in the Rev. Charles Kingsley. He founded a workingmen's college in London, to which he devoted much time and attention. In 1846 he was appointed chaplain and reader to Lincoln's Inn, and about the same time professor of theology in King's college, London, which latter post he resigned in 1853; and in 1860, by the queen, incumbent of the district church of Vere street, Marylebone. In 1866 he became professor of moral philosophy in the university of Cambridge, and in 1867 received the

honorary degree of M. A. Charles Kingsley says that, although he was a great and rare thinker, he was greatest in his personal influence. His principal works are: "Theological Essays" (1853), which cost him his professorship in King's college; "Philosophy of the First Six Centuries," and "Unity of the New Testament" (1854); "The Patriarchs and Lawgivers of the Old Testament," and "The Prophets and Kings of the Old Testament" (1855); "The Epistles of St. John," and "Mediæval Philosophy" (1857); "Parochial Sermons" (6 vols., 1860); "The Religions of the World," and "Lectures on the Apocalypse" (1861); "Modern Philosophy" (1862); "The Gospel of the Kingdom of Heaven" (1864); "The Gospel of St. John," and "The Conflict of Good and Evil in our Day" (1865); "The Workman and the Franchise," and "The Commandments, as Instruments of National Reformation" (1866); "The Conscience" (1868); and "Social Morality, Twenty-one Lectures delivered in the University of Cambridge" (1869). In connection with a layman he wrote "The Claims of the Bible and of Science" (1863). A posthumous work on the Lord's prayer, with a biographical sketch, was published in 1872, and "The Friendship of Books, and other Lectures," edited by Thomas Hughes, in 1874. A memorial of him has been printed, the proceeds to be devoted to placing his bust in Westminster abbey, to establishing the workingmen's college on a more permanent basis, and providing for lectures in it, chiefly on the history and study of the Bible.

MAURICE, Thomas, an English clergyman, born in Hertford about 1755, died in London, March 30, 1824. He graduated at Oxford, and became curate of Woodford in Essex. He resigned that post in 1785, and accepted a small pastorate at Epping. In 1799 he became assistant librarian to the British museum. His principal works are: "Indian Antiquities" (7 vols. 8vo, London, 1791-'7); "History of Hindostan" (3 vols. 4to, 1795-'9); "Modern History of India" (2 vols., 1802-'4); and his personal "Memoirs" (3 vols., 1819-'22).

MAURICE OF SAXONY. See **SAXE**.

MAURICIUS, Flavius Tiberius, a Byzantine emperor, born in Arabissus, Cappadocia, about 539, executed Nov. 27, 602. Descended from an ancient Roman family, he passed his youth in the camp and at the court of Justin II., and on the accession of Tiberius II. in 578 was appointed to conduct the war against the Persians. In 580 and 581 he totally overthrew the Persians in two pitched battles, and returned to Constantinople in triumph. On the death of Tiberius, who proposed Mauricius for his successor, the latter ascended the throne amid universal rejoicing (582). The Persians immediately renewed the war, and twice defeated the Byzantine commander-in-chief on their borders. Mauricius sent out his brother-in-law Philippius, who gained a great victory at Solacoon in 586, but soon after suffered

a total defeat in Arzanene. Philippius was deposed, but raised a mutiny, by which he regained the command only to give new proof of his incompetency; he was again deposed, and Heraclius retrieved the fortunes of the empire by repeated victories. The war which succeeded between the Turks and Persians gave relief to the Byzantine arms. The Persian king Chosroes II., being driven into exile, took refuge in the Byzantine territory, and wrote a letter to Mauricius imploring aid. The emperor gave him a large sum of money, and sent a powerful army for the invasion of Persia. The Persian rebel Bahram was decisively defeated at Balarath, Chosroes was restored to his throne (591), and from this time till the death of Mauricius there was peace between Persia and the empire. Hostilities, begun in 587, had in the mean while been carried on against the Avars. After one defeat the barbarians refrained from any incursion for five years. When they again threatened the empire, Mauricius intended to put himself at the head of the army; but it was already the Byzantine custom for the emperor not to command in the field, and yielding to the remonstrances of the senate, he sent Priscus as a substitute. He was unsuccessful, and was superseded by the emperor's brother Peter, and the latter soon after by Commentiolus, who suffered a disastrous defeat, in which 12,000 Byzantines were made prisoners by the Avars, and engaged in treacherous intrigues. The fortune of the war was restored in five successive battles by Priscus, who was again placed in command. In 602 he was ordered by Mauricius to pass to the northern side of the Danube into the Avar territory. The emperor had allowed the prisoners taken by the Avars to be put to death rather than ransom them, the reason probably being that they were the mutinous and dangerous soldiers of Commentiolus. The troops of Priscus now complained that they were destined to destruction like the 12,000 prisoners, organized a rebellion, made Phocas commander-in-chief, and marched toward Constantinople; and while an insurrection arose in the city, Mauricius escaped with his family by sea, took refuge in the church of St. Antonomus, near Chalcedon, and despatched his son to Chosroes to ask him in turn for aid in the recovery of his throne. The emissaries of Phocas, who had been proclaimed emperor, found him in the sanctuary, and dragged him thence to the scaffold. Five of his sons were executed with him, his eldest son Theodosius soon after, and the empress and three of her daughters were imprisoned and afterward put to death. He was distinguished for habits of self-control, affection, and piety. He strictly enforced beneficial laws, protected art and learning, and wrote a treatise on the military art, which still exists.

MAURITANIA, or *Mauretania*, in ancient geography, the N. W. coast of Africa, including the modern Morocco and part of Algeria. It was

bounded N. by the Mediterranean, E. by the river Ampsaga, which separated it from Numidia, S. by the Atlas mountains, and W. by the Atlantic. Numerous rivers intersect this mountainous region and empty either into the Atlantic or the Mediterranean; among them, besides the Ampsaga, may be mentioned the ancient Sala, Subur, Lix, Mulucha, and Chinaph. The Phœnicians at a remote age founded so many settlements here, that along the whole coast there was not a single town whose population was not of Canaanitish race. Herodotus does not mention the nations of this region. Later writers say that from the earliest times it was inhabited by Maurisii or Mauri (Moors), blacks, a tribe probably of the same race as the Numidians; but their accounts of the origin or immigration of this people seem to be fabulous. The people have by recent research been connected with the Libyans of the Egyptian monuments. (See LIBYANS.) They first became known to the Romans when the latter in their contests with the Carthaginians had carried the war into Africa. In the Jugurthine war Bocchus, king of Mauritania, was conspicuous, and his sons Bogudes and Bocchus were confirmed as joint kings of the country by Julius Cæsar in 49 B. C. In A. D. 42 the Romans divided the kingdom into two provinces separated from each other by the river Malua or Mulucha; the western province was called Mauritania Tingitana, and the eastern Mauritania Cæsariensis. The Romans founded in these provinces 21 considerable colonies, and introduced into the population a large element of Italian origin. In 429 the Vandals, led by Genseric, conquered Mauritania; but in 534 it was reconquered by Belisarius, and remained a province of the empire till it was overrun and subdued by the Mohammedan Arabs about the close of the 7th century. (See MOORS, and MOROCCO.)

MAURITIUS, or *Isle of France*, an island belonging to England, in the Indian ocean, between lat. 19° 58' and 20° 31' S. and lon. 57° 21' and 57° 51' E., about 500 m. E. of Madagascar, 120 m. E. N. E. of Réunion, and 2,700 m. from the Cape of Good Hope; length N. and S. 39 m., greatest breadth 27 m.; area, 676 sq. m.; pop. in 1872, 326,454. The island is divided into nine districts. (See map.) Port Louis is the capital and the port through which all the foreign trade is carried on. The population is made up of various Asiatic, African, and European races, and of every conceivable admixture of them all. Among them are several thousand Hindoos, by whom the sugar estates are mostly worked. The English element is generally confined to the public functionaries and a few merchants, and has not penetrated the mass of the population. English is little spoken.—There are numerous capes and bays along the shore, and the island is encircled by coral reefs at various distances, but generally parallel to the land. In these reefs there are 11 passes, through most of which large vessels may enter and find good

anchorage within. The rivers are of little importance; in the rainy season they are swollen into torrents, while in the dry they are little more than brooks. There are several lakes, which are called either *bassins* or *mares*. The largest is the Grand Bassin in the mountains of Savane. The Mare aux Vakois, named from the *vakoi* or screw pine (*pandanus utilis*), which abounds in the district, and with which it is encircled, covers about two square miles in rainy weather. Many streams flow into it; it is in some places 25 fathoms deep, and is well stocked with crawfish, prawns, eels of enormous size, and a small red fish originally brought from China. Mauritius is exceedingly picturesque, having lofty ranges of hills, with bold and grand outlines. It is intersected by three principal chains of mountains, with spurs radiating to the coast, which vary from 1,800 to 2,800 ft. above the sea, and many of

ferruginous rocks and grayish lava. Iron ore is very abundant, but the iron is of inferior quality.—The heat, which is greatest from November to April, is tempered on the coasts by sea breezes, and in the interior by the elevation of the surface; and the climate is so salubrious, that Europeans whose health is impaired in India come here to restore it. The mean annual temperature at Port Louis is about 74° F., and somewhat less on the opposite side of the island. The average annual fall of rain at Port Louis is 39.25 inches. The rainy season is from January to April, but showers are frequent at all times, particularly in the interior. Between December and May the island is subject to hurricanes, for which its neighborhood is famous. In 1773 the church and about 300 houses were destroyed at Port Louis by a hurricane; and on the opposite side of the island the sea rose 45 ft. In March, 1818, and February, 1824, great hurricanes did immense damage to the plantations and shipping, and caused the loss of many lives. During a terrible cyclone on March 10–12, 1868, nearly 3,000 valuable buildings were destroyed, including some of stone and iron, and more than 20,000 huts of the laboring population; the number of persons killed was 59; and a vast amount of property of all kinds was destroyed. The mortality among the troops is very little greater than in Europe, and does not much exceed 3 per cent. per annum. But of late years malarious fevers have prevailed, and in 1872 had become endemic and were likely to occur with more or less severity in every hot season. In 1867 the number of deaths in the island was 40,114, or 12 per cent. of the population; but no such terrible mortality has occurred in any other year. The number of deaths in 1868 was 18,403, and it continued to decrease till 1871, in which year and 1872 there was again a slight increase. In 1871 the mortality from fever was nearly 45 per cent. of that from all causes; and in 1872 it was 43 per cent.—The chief production is sugar; coffee is grown, and rice in small quantities; but the production of all articles of food is far inferior to the consumption. The vegetation in general resembles that of the Cape of Good Hope. Indigo, cotton, and spices have been successfully cultivated. The native timber is of excellent quality and considerable variety, including ebony (the finest in the world), oak, ironwood, and a kind of pine. The *vacona* or screw pine (*pandanus utilis*) is not only a very common wild plant, but is largely cultivated for the sake of its leaves, extensively used in the manufacture of the sacks in which the sugar is exported. Nearly every beautiful tree of the tropics flourishes here. The indigenous fruits are of little value, and are chiefly those of the ebony and palmiste; but guavas, 13 kinds of bananas, peaches, pineapples, mulberries, and strawberries are raised on most of the plantations. The government botanic gardens at Pamplemousses, established by M. Poivre, the gover-



are of very singular form. The most remarkable is Pieter Booth or Peterbote, 2,874 ft. high, terminated by a spire of naked rock, on the top of which rests an immense mass of stone, larger than the point on which it is balanced. The highest peak is the Piton of the Riviere Noire, which is 2,902 ft. above the sea. Another, called Le Pouce from its resemblance to the human thumb, is 2,707 ft. high. There are many curious caverns, of considerable extent, in some of the ranges. In the centre of the island, on an elevated plateau, there is a mountain of a sugar-loaf form called Piton du Milieu de l'Île. The land rises gradually from the shore to the interior, and the N. end is more elevated than the S. The island presents numerous indications of volcanic origin. The rocks rise in strata from the shore to the centre of the island, upon which there are many mountains composed of

nor in 1768, are remarkable for their varied productions, and contain the richest and rarest plants of the East. With a view to improving the culture of the cane, an agricultural society was formed in 1853 by the principal planters. The surface of the ground being to a great extent covered with stones, renders the use of the plough impracticable, and cultivation is chiefly carried on by the hoe. Guano is extensively used as a manure. Its power in increasing the product of the cane is at first almost incredible, but in a few years it exhausts the land. Deer and wild hogs and goats are abundant in the mountains, and short-legged hares are numerous in the plains. Apes are to be found in the forests, and are frequently used as food by the negroes. The tenrec, a species of hedgehog, is common, and with the moutouck, an insect which eats into the heart of trees, is delicate food in the dry season for the wood cutters of the Plaines Wilhelms. There are great numbers of rats, which are exceedingly destructive, and mice are common. The birds of the island are not numerous, and are mostly of the smaller tribes, with partridges, wood pigeons, and doves, and in the marshy spots a kind of water hen. The only bird of prey is a species of hawk. Mauritius was once the home of the dodo and of a number of other birds of species now supposed to be extinct. Among these were the "giant" (*Lequatia gigantea*), a kind of water hen, 6 ft. high, and a red bird of the rail family, with a bill like a snipe (*aphanapteryx imperialis*). The martin, introduced from Asia, has checked the increase of insects. There is still, however, a considerable variety of beautiful insects on the island, among which are butterflies, moths, great numbers of grasshoppers, wasps, and wild bees. A most destructive insect, called the *kakerlac* (*blatta Americana ferruginea*), is one of the greatest pests of the island, attacking every kind of substance, leather, binding of books, and provisions. Ants infest every place, and one kind occasions great damage to trees and wood work. There are no serpents, nor any venomous insects, except small species of scorpion and centipede. The fish on the coast are abundant and excellent; and there is a great variety of crabs and mollusks. The lobster attains a prodigious size. The sea slug so highly esteemed in China is found within the reefs. Horses, mules, donkeys, horned cattle, sheep, and hogs are imported. In 1870 there were on the island 18,394 horned cattle and 18,059 sheep.—Sugar was exported in 1863 to the amount of 296,512,877 lbs., the largest quantity ever exported in any one year; in 1868, 221,760,000 lbs.; in 1869, 239,680,000 lbs.; in 1870, 228,480,000 lbs.; in 1871, 275,520,000 lbs.; and in 1872, 284,480,000 lbs. The average price per pound since 1867 has been 2½d. The total value of the exports to Great Britain for the five years 1868-'72 was as follows: 1868, £1,055,419; 1869, £667,515; 1870, £871,387; 1871, £833,386;

1872, £1,539,565. The total value of the exports to all countries in 1871 was, by official returns, £3,053,054, or including specie £3,120,528; and in 1872, £3,177,301, or including specie £3,243,112; "but the true exports," says the government administrator, "undoubtedly far exceeded the amount declared." The value of the imports from Great Britain in the same period was as follows: 1868, £404,425; 1869, £399,879; 1870, £499,975; 1871, £538,909; 1872, £5,911,712. The total value of the imports from all countries in 1871 was £1,807,382, or including specie £2,044,386; and in 1872, £2,487,512, or including specie £2,677,974. The only home product of noteworthy amount exported, besides sugar, is rum. Mauritius is mostly dependent upon imported provisions and manufactures. In 1870, 574 ships arrived, of which 322 were British, 39 French, and 3 from the United States. In 1872 the total tonnage of vessels entered and cleared was 543,452. The main roads of the island are good, being mostly macadamized and kept in order by the government. There are two lines of railway: the North line, from Port Louis to Grande Rivière S. E., and the Midland, from Port Louis to Mahébourg, each of which has short branch lines. The scenery upon the latter line is very fine. Telegraphs are established along the lines.—There are at Port Louis a convent with a large boarding school attached for young ladies, and a convent with a hospital attached under the charge of the sisters of charity. There is also a royal college, in connection with which a new elementary school was opened in 1872; a branch school at Curepipe, and numerous other public schools, are in a very flourishing condition. The total number of pupils on the rolls of the government schools in 1872 was 5,040; and the annual grant for schools voted by the legislature is about £5,000. The Roman Catholic is the prevailing religion, presided over by a bishop. There are 17 Catholic churches and 32 chapels. The church of England is represented by a bishop with the title "Lord Bishop of Mauritius and its Dependencies." Both the Protestant and Catholic clergy are paid out of the colonial treasury. Mohammedanism is professed by some of the inhabitants, and a mosque is in course of building. Several newspapers are published at Port Louis, only one of which is in the English language.—The government of the island is vested in a governor aided by an executive council, and a legislative council consisting of seven official members and ten non-official members chosen from the chief landed proprietors of the island, and confirmed in their appointment by the crown. There is a supreme court of civil and criminal justice, presided over by three judges; and a petty court for the trial of trivial crimes and offences. The revenue of the island, chiefly derived from customs and licenses, was for 1871 and 1872 £468,851 and £528,689; and the expenditure, £445,111 and £464,149 respectively. The gross

railway revenue for the same years was £103,462 and £116,446, and the expenditure £73,194 and £88,423. The estimated army expenditure for 1872-'3 was £55,300; about one half of this outlay is generally contributed by the insular government.—The granitic island of Rodriguez; the Seychelles islands, 35 or 36 in number; the Carga dos Garayos or St. Brandon isles, 16 in number; the Perhos Banhos, 25 in number; the Amirantes, 17 in number; Diego Garcia, and several smaller, are dependencies of Mauritius. Rodriguez is about 330 m. to the eastward, in lat. 19° 41' S. It is 26 m. long by 12 broad, and is composed of hills, with intervening valleys covered to a great extent with rocks and stones. There is an abundance of fish around the island, great quantities of which are salted and sent to Mauritius; and sperm whales abound in the vicinity. The island of St. Brandon is noted for its scarlet coral (*tubifera musica*). The Seychelles are between lat. 3° 30' and 5° 45' S. They were discovered but never occupied by the Portuguese. In 1742 the French took possession of them and named them Îles de Labourdonnais, but the name was soon changed to Seychelles, after the vicomte Hérault de Seychelles. When Mauritius was taken possession of by the British, this group fell into their hands with it. The chief of the islands are Mahé, Praslin, Silhouette, La Digue, and Curieuse, and the area of the whole group is about 50,000 acres. More than half of this area is included in Mahé, which is 16 m. long and from 3 to 5 m. wide, with a very steep and rugged granite mountain running through the centre, of which the principal peak, Morne Blanc, is 2,000 ft. high. The vegetation of this island, as well as of many others of the group, is exceedingly luxuriant; among the productions are cotton, sugar cane, tobacco, and various spices. The town of Port Victoria, formerly Mahé, is situated on the N. E. coast; pop. estimated at about 7,000. These islands are a favorite resort for whaling vessels; all have abundance of excellent water. The most remarkable production is the *coco de mer* (*Lodoicea Seychellarum*), so called because the nuts, weighing some 40 lbs. each, were found on the coast of Malabar long before the place of their growth was known. Tortoise shell is procured in considerable quantities. Storms are unknown; and notwithstanding their proximity to the equator, the climate is agreeable, the heat being tempered by the sea breezes. Diego Garcia lies about 14° further E., and is a low coral island. It abounds with turtle, and has a few residents from Mauritius. The Amirantes are a group of low coral islands about 100 m. S. W. of the Seychelles. They supply vessels with water, coconuts, sheep, fish, and turtle.—Mauritius was discovered in 1505 by Pedro Mascarenhas, who called it Cerné. The Portuguese held it till 1598, when a Dutch squadron took possession of it, the commander changing the name to Mauritius, in honor of Maurice

of Nassau. The Dutch first settled here in 1644, but they abandoned it in 1712 for the Cape of Good Hope; and it was taken in 1715 by the French, who called it Île de France. The first regular settlement took place in 1721; and under Mahé de Labourdonnais, who introduced the cultivation of the sugar cane, indigo, and manioc, and was appointed governor in 1734, the colony became very prosperous. It was during his second administration that the ship St. Geran was wrecked, in which was lost the young lady whose story was the basis of Bernardin de Saint-Pierre's tale of "Paul and Virginia." During the wars of the revolution and empire, the French island owed most of its wealth to corsairs, the terror of British merchant vessels in the Indian seas. The British seized the island with its dependencies in 1810, and by the peace treaties of 1814 and 1815 the English possession of the island was ratified. In 1835 slavery ceased to exist in Mauritius. The island was made a bishopric in December, 1854.—See Pike's "Subtropical Rambles in the Land of the Aphanapteryx" (New York, 1873).

MAUROCORDATOS. See MAVROCORDATOS.

MAURY, a central county of Tennessee, intersected by Duck river and drained by its tributaries; area, 570 sq. m.; pop. in 1870, 36,289, of whom 16,265 were colored. It has a diversified surface, and the soil is fertile. It is intersected by the Nashville and Montgomery line of the Louisville, Nashville, and Great Southern railroad, and the branch to Mount Pleasant. The chief productions in 1870 were 200,684 bushels of wheat, 1,449,935 of Indian corn, 61,387 of oats, 28,570 of Irish and 24,962 of sweet potatoes, 14,245 lbs. of tobacco, 35,544 of wool, 167,372 of butter, 4,114 tons of hay, and 9,367 bales of cotton. There were 8,464 horses, 5,346 mules and asses, 6,735 cows, 11,093 other cattle, 21,330 sheep, and 53,124 swine; 3 flour mills, 1 cotton mill, 16 saw mills, 14 tanneries, and 6 wool-carding and cloth-dressing establishments. Capital, Columbia.

MAURY, Jean Siffrein, a French cardinal, born at Valréas, Venaissin, June 26, 1746, died May 11, 1817. He was the son of a shoemaker, and was educated for the priesthood at Avignon. At the age of 20 he went to Paris as *abbé précepteur*, but devoted himself to preaching, obtained an *accessit* from the academy for an *éloge* on Fénelon in 1770, and by his panegyrics on St. Louis in 1772 and St. Augustine in 1775 placed himself at the head of the French pulpit orators of the time. He was appointed preacher to the court, pleased both believers and philosophers, and through the influence of the former obtained the abbey of Frénade and the priory of Libons, and through that of the latter a seat in the academy. In 1785 he pronounced his masterpiece of religious eloquence, a panegyric on St. Vincent de Paul. At the convocation of the states general he was chosen to it as a deputy of the clergy, immediately took a leading part in the debates as a defender

of the church, aristocracy, and royalty, and was the most daring and powerful antagonist of Mirabeau. Until the flight of Louis XVI. he opposed the revolutionary measures with pre-eminent skill and at constant peril. At the close of the constituent assembly he left France, and was received with a triumph at Rome, where he took up his residence. He was made successively archbishop of Nicæa *in partibus*, nuncio to the diet at Frankfort for the election of emperor, cardinal, and bishop of Montefiascone and Corneto. On the invasion by the French in 1793 he escaped in disguise to Venice, and passed thence to St. Petersburg. Returning in 1799, he was appointed by the count of Provence (afterward Louis XVIII.) his ambassador to the holy see, but became reconciled to Napoleon, and returned to France in 1806. He was declared a French cardinal, was consulted in ecclesiastical affairs, and elected a member of the institute, but lost the esteem of his former friends. In 1810 he was appointed archbishop of Paris, and his florid episcopal charges were subjects of ridicule, and showed no signs of his former energy. When the pope was taken to Savona as a captive of Napoleon, he ordered Cardinal Maury to relinquish the administration of his diocese. He disobeyed, and after the restoration was imprisoned at Rome. His *Essai sur l'éloquence de la chaire* (2 vols., 1810) is still esteemed.—See Poujoulat, *Le cardinal Maury, sa vie et ses œuvres* (Paris, 1855).

MAURY, Louis Ferdinand Alfred, a French author, born in Meaux, March 23, 1817. In 1836 he became attached to the royal library, which he quitted in 1838. His bibliographical knowledge caused him to be recalled in 1840, and in 1844 he was elected sub-librarian to the institute. In this office he rendered important services, and in 1857 he was elected a member of the academy of inscriptions and belles-lettres. In 1860 he was appointed librarian of the Tuieries, in 1862 professor of history and moral philosophy in the collège de France, and in 1868 director general of the archives. His principal publications are: *Essai sur les légendes pieuses du moyen âge* (Paris, 1843); *Les fêtes du moyen âge* (1855); *Histoire des grandes forêts de la France* (1856); *La terre et l'homme* (1856), a summary of recent geographical, ethnological, and philological researches; *Histoire des religions de la Grèce antique* (3 vols., 1857-'60); and *Musée d'archéologie*, an account of a collection from the Merovingian period till the first French revolution, with 1,200 facsimile autographs by Charles Bethmont.

MAURY, Matthew Fontaine, an American hydrographer, born in Spotsylvania co., Va., Jan. 14, 1806, died in Lexington, Va., Feb. 1, 1873. His parents removed while he was still young to Tennessee. In 1825 he entered the naval service as midshipman, and was appointed to the Brandywine, then fitting out to convey Lafayette to France. He returned with this vessel in 1826, and made a voyage in her to the Pacific, where he was transferred to the sloop

of war Vincennes, in which he circumnavigated the globe. During this cruise, and while yet a passed midshipman, he began his "Treatise on Navigation," which passed through several editions, and was used as a text book in the navy. In 1836 he was promoted to a lieutenantcy, and received the appointment of astronomer to the South sea exploring expedition, but resigned it. In 1839 he met with an accident which resulted in permanent lameness and unfitted him for service afloat. He was now placed in charge of the depot of charts and instruments at Washington, afterward known as the hydrographical office; and upon the organization and union with it of the national observatory in 1844, he was made superintendent of the combined institutions. Before this he had begun a series of investigations in what Humboldt has called the "physical geography of the sea," and had gathered many observations of the ocean winds and currents from the records of naval and merchant vessels. In some cases special cruises were made to supply data, until material was collected for a systematic study of the actual course of winds and currents. In 1844 he made known his conclusions respecting the Gulf stream, ocean currents, and great-circle sailing, in a paper read before the national institute, and printed under the title of "A Scheme for Rebuilding Southern Commerce." With the accumulation of material the need was felt of systematizing the observations and records themselves, particularly as ships of different nations used different methods of observation and registry. Lieut. Maury accordingly entered into a project for assembling a general maritime conference, which at the suggestion of the United States government met in Brussels in 1853, and recommended a form of abstract log to be kept on board ships of war and merchant vessels. The principal results of Maury's researches are embodied in the "Physical Geography of the Sea" (New York, 1856, several times revised and greatly enlarged; last ed., "Physical Geography of the Sea and its Meteorology," 1873). In 1855 Lieut. Maury was promoted to the rank of commander. On the outbreak of the civil war he resigned and was made a commodore in the confederate navy, and subsequently professor of physics in the Virginia military institute. He was a member of many of the principal scientific associations of America and Europe, and received valuable testimonials from several foreign governments. Besides the works already mentioned, he published "Letters on the Amazon and the Atlantic Slopes of South America;" "Relation between Magnetism and the Circulation of the Atmosphere," in the appendix to "Washington Astronomical Observations for 1846" (1851); "Astronomical Observations" (1853); "Letters concerning Lanes for the Steamers crossing the Atlantic" (1854); "Manual of Geography: a Complete Treatise on Mathematical, Civil, and Physical Geography" (1871); and smaller works on geography.

MAUSOLEUM. See **HALICARNASSUS.**

MAUVE (Fr., purple mallow), a dyeing material obtained by the oxidation of aniline, a product of coal tar. It was first extracted by Mr. Perkin of England, who gave it this name. It is prepared by dissolving equivalent proportions of sulphate of aniline and bichromate of potash in water, mixing, and allowing them to stand some hours. A black precipitate, obtained on filtering, is washed, dried, and digested in coal-tar naphtha to extract a brown resinous substance. The coloring matter is then extracted by digestion in alcohol, and is obtained on distilling off the spirit in a coppery friable mass; or it may be kept liquid in alcohol. The colors it gives are a variety of shades of purple, the blue predominating in some, and red in others. (See **ANILINE**, and **DYEING**.)

MAVERICK, a S. W. county of Texas, separated from Mexico by the Rio Grande, and intersected by San Ambrosio river; area, 900 sq. m.; pop. in 1870, 1,951, of whom 281 were colored. Only a small portion of the land is fit for cultivation. The chief productions in 1870 were 8,315 bushels of Indian corn and 24,060 lbs. of wool. There were 294 horses, 797 milch cows, 28,863 other cattle, and 17,932 sheep. Capital, Eagle Pass.

MAVROCORDATOS, Alexander, a Greek statesman, born in Constantinople in February, 1791, died in Ægina, Aug. 18, 1865. He made himself an accomplished linguist, and in 1817 was secretary of his uncle Caradja, hospodar of Wallachia. Subsequently he resided for some time in Switzerland and Italy. In 1821, on the outbreak of the Greek revolution, he sailed with a number of French and Italian volunteers to the Peloponnesus, and was sent to organize the insurrection in Ætolia and Acarnania. At the close of the year he was elected president of the national assembly at Epidaurus, which framed the provisional constitution and promulgated the declaration of independence (January, 1822). He was made soon after *proedros* or president of the executive committee. In the following years, as commander-in-chief, he distinguished himself in the defence of Missolonghi, Navarino, and Sphacteria. A supporter of liberal tendencies, he violently opposed the Russian leanings of both John and Augustine Capo d'Istria. In 1833-'4 he was in the cabinet of King Otho, and afterward was ambassador at Munich, Berlin, and London, whence he was recalled in July, 1841, to take the presidency of the ministry. In 1843 he was a special ambassador to the Porte, and for a short time in 1844 was again at the head of the ministry. In 1850-'54 he was ambassador at Paris, and on his return was once more placed at the head of the cabinet, from which in 1856 he resigned and retired to private life.

MAWMOISINE. See **MALVOISINE.**

MAXCY, Jonathan, an American clergyman, born in Attleborough, Mass., Sept. 2, 1768, died in Columbia, S. C., June 4, 1820. He gradu-

ated at Brown university in 1787, and in September, 1791, was instituted pastor of the first Baptist church of Providence, and at the same time elected professor of divinity in Brown university. In the succeeding September, although but 24 years of age, he became its president. In 1802 he was elected president of Union college, N. Y., and in 1804 of the South Carolina college. This latter station he occupied until his death. His "Literary Remains, with a Memoir," was published by the Rev. Romeo Elton (New York, 1844).

MAXENTIUS. See **CONSTANTINE I.**, the Great.

MAXIMIANUS I. See **DIOCLETIAN.**

MAXIMIANUS II. See **GALERIUS.**

MAXIMILIAN I., emperor of Germany, born in Neustadt, near Vienna, March 22, 1459, died at Wels, Jan. 12, 1519. He was the son of the emperor Frederick III., of the house of Hapsburg, and of Eleanor, a princess of Portugal. He learned to speak several languages, acquired various branches of knowledge, and, spending his youth in the wars of his father with Podiebrad of Bohemia, Matthias Corvinus of Hungary, and others, became an excellent horseman, tilter, and hunter, gallant, chivalric, and adventurous. His father, faithful to the maxim of his house to conquer by marriages, sought for him the hand of Mary, daughter and heiress apparent of Charles the Bold of Burgundy, promising a royal crown to the duke. The parties and their parents met at Treves in 1473; but the mutual distrust of the latter broke off the negotiations. After the death of Charles (1477) his widow Margaret rejected the offers of Louis XI. of France in behalf of his infant son Charles (afterward VIII.), and soon afterward the rich and beautiful heiress became the wife of Maximilian, and in a few years the mother of two children, Philip and Margaret. But her husband neither saved all her possessions from the rapacity of Louis XI., nor obtained the ready allegiance of the rich cities of the Netherlands, when on her sudden death by a fall from her horse in 1482, he claimed the regency for his son Philip. Louis was active in instigating and promoting revolts in those provinces, and Maximilian suffered still greater injury from France when, after his election and coronation as king of the Romans (1486), having married by proxy another rich heiress, Anne of Brittany, and promised his own daughter Margaret to Charles VIII., Anne de Beaujeu, the regent for the latter, suddenly broke off both engagements, bringing Brittany with Anne into the hands of Charles, and sending back Margaret to her father. The war which ensued was of short duration. Maximilian now married Bianca Sforza, daughter of the murdered duke of Milan, Galeazzo Maria, receiving 300,000 ducats from her uncle and guardian, the bloody Ludovico Moro, on whom he bestowed Milan, the heritage of the brother of his bride. The wife of the lawful heir, however, a Neapolitan princess, sought for aid from her native coun-

try, and the usurper Moro thereupon prevailed on the king of France to renew the old claims of the house of Anjou to Naples, and to enter on an Italian campaign. This led to those long Italian wars, in which during Maximilian's lifetime Charles VIII., Louis XII., and Francis I. of France, Ferdinand the Catholic of Spain, the popes Alexander VI. and Julius II., the empire, Switzerland, the republic of Venice, and Naples were principally engaged. Campaigns, treaties of peace, alliances, and treacherous desertions of allies followed in rapid succession; but the details belong to the history of the more important actors. Maximilian, who in 1493 had succeeded his father as emperor, played in the whole a secondary part, so far inadequate to his schemes were the supplies which he was able to extort from the unwilling states. One of these plans was that of becoming pope after the death of Julius II. Instead of aiding their emperor, the states of Germany were always ready to complain, and the empire itself was not a little distracted by feuds, in spite of the eternal peace decreed by the diet of Worms in 1495, of the new *Reichskammergericht*, and the exertions of the Swabian league for the maintenance of order. Switzerland, which was to be reconquered, now entirely detached itself from the Germanic body, whose head saw himself often deserted by his allies, sometimes by his own troops, and frequently penniless. The troubles of the reformation broke out shortly before his death. In the mean time he had not neglected to continue the safer and peaceful conquests of his house. Philip and Margaret, his only two children by Mary of Burgundy, married Juana and Juan, the children of Ferdinand of Aragon and Isabella of Castile; Philip succeeded to the throne of Castile in 1504, and died in 1506; and his son Charles, on the death of Ferdinand in 1516, inherited the whole of Spain. This young prince also became the successor of Maximilian as emperor of Germany, under the name of Charles V., his younger brother Ferdinand receiving the German possessions of Austria, and subsequently, in consequence of other marriage connections, also ascending the thrones of Hungary and Bohemia. Having also succeeded Charles V. in the empire, Ferdinand I. left all his thrones to his good-natured but feeble son Maximilian II. (1564-'76). Maximilian I. left several treatises on military science, gardening, the chase, and other subjects, and a poetical work on his own life.

MAXIMILIAN (FERDINAND MAXIMILIAN JOSEPH), archduke of Austria and emperor of Mexico, born in Vienna, July 6, 1832, shot in Querétaro, Mexico, June 19, 1867. He was the second son of the archduke Francis Charles and of the archduchess Sophia, and a brother of the present emperor Francis Joseph. He entered the naval service, and in 1854 became rear admiral and chief of the navy, and in 1857 governor of the Lombardo-Venetian kingdom. In the same year he married in Brussels (July

27) the princess Charlotte, daughter of Leopold I. and sister of the present king of the Belgians. On the outbreak of the war of 1859 he retired to Venice, and subsequently to his beautiful château of Miramar near Trieste. Here, with the exception of a voyage of scientific exploration to Brazil, he resided until his departure, April 14, 1864, for Mexico, having accepted, at the instance of Napoleon III., the crown of Mexico, under the name of Maximilian I., with the consent of the emperor of Austria and of that portion of the people of Mexico whose sanction could be secured through French influence. He had waived his claim of succession to the throne of Austria in the event of his brother's death, and made farewell visits at the French, Belgian, and English courts; and in Rome he received the pope's blessing. He landed with his wife at Vera Cruz, May 28, 1864. An auxiliary corps was organized in Austria and Belgium, and a loan was raised in France for the benefit of the new Mexican empire, which was intended by Napoleon to consolidate the power of the Latin race in the new world. One of the first measures of Maximilian, who was childless, was to adopt a son of the emperor Iturbide as his presumptive successor on the throne. He established committees for the regulation of public affairs, promulgated an amnesty, and manifested excellent intentions for the faithful administration of the government; but he soon lost the support of the clergy, who were grievously disappointed by his failure to restore their sequestered estates, and who had been almost his only zealous partisans. Almost from the beginning he found himself confronted by formidable difficulties, which increased in proportion to the determined resistance of President Juárez and of the masses of Mexicans to the French invasion and to his usurpation of the throne, a resistance encouraged by the dissatisfaction of the United States with European encroachments upon the American continent. In 1865, after the close of the civil war in the United States, the attitude of the latter government became more determined; and public opinion in France, and the increasing complications of Napoleon at home and abroad, admonished the latter to abandon the scheme. The empress Charlotte in vain attempted in 1866, in interviews with Napoleon in Paris and with the pope in Rome, to change the current of events. While in Rome her mind gave way under the pressure of anxiety, and she has ever since lingered at the château of Laeken hopelessly insane. Napoleon, having formally undertaken to withdraw his troops, despatched Gen. Castelnau to the city of Mexico to reconcile Maximilian to the necessity of abdicating; but the latter would not entertain such an idea, and went to Orizaba to avoid meeting the French envoy. Here in November he assembled his ministers, who were nearly all opposed to his abdication, and on Dec. 5 he called a national congress,

by whose decision he promised to abide. But no such assembly could be brought together, owing to the opposition of the great majority of republicans; and the meeting of Jan. 14, 1867, consisted of only 35 notables, all but 10 of whom were opposed to the abdication. But no practical result could have been achieved under any circumstances, as the authority of Juárez was never restored excepting in the cities of Mexico, Puebla, Vera Cruz, and Querétaro. Besides, Maximilian's exchequer was empty, and the withdrawal of the French under Bazaine included even those who had enlisted in his army. Yet, instead of remaining in the capital, to which he had returned, and where there were more adequate means of resistance than anywhere else, he decided on removing to Querétaro with a single corps (Feb. 13), and offering battle to his adversaries, who speedily besieged that place. He made several gallant but unavailing sorties, and he and his soldiers were reduced to the last extremities by the exhaustion of provisions, when he decided to escape through the enemy's line (May 15). But Gen. Escobedo, having gained access to the city in the preceding night through the treachery of Col. Lopez, arrested Maximilian and Gens. Miramon and Mejia. After a fruitless effort to procure the intervention of the United States in his behalf, he was sentenced to death by court martial, June 13, and shot six days afterward, together with the two generals. The emperor of Austria sent Vice Admiral Tegetthoff to Mexico to convey his remains to Vienna, where they were interred in the imperial vault, Jan. 18, 1868.—His writings have been published under the title *Aus meinem Leben, Reiseskizzen, Aphorismen*, &c. (7 vols., Leipzig, 1867). See also Eugène de Kératry, *L'Empereur Maximilien, son élévation et sa chute* (Paris, 1867); Hellwald, *Maximilian I., Kaiser von Mexico, nebst Abriss der Geschichte des Kaiserreichs* (Vienna, 1869); and Kendall, "Mexico under Maximilian" (London, 1872).

MAXIMILIAN JOSEPH, "duke in Bavaria," a German author, born in Bamberg, Dec. 4, 1808. He is the only son of Pius Augustus, duke in Bavaria, married in 1828 the princess Louisa, a daughter of King Maximilian I., and was appointed to a high rank in the army. He described his journey to the East in 1838 in his *Wanderung nach dem Orient* (Munich, 1839). His other works, published under the nom de plume of Phantasus, include *Novellen* (2 vols., 1831); *Skizzenbuch* (1834); the novels *Jakobina* (1835) and *Der Stiefbruder* (1838); and *Sammlung oberbayerischer Volkslieder und Singweisen* (1846). He has three sons and five daughters, one of whom, Elizabeth, became in 1854 the wife of the emperor Francis Joseph of Austria.

MAXIMIN (CAIUS JULIUS VERUS MAXIMINUS), a Roman emperor, born in Thrace in the latter part of the 2d century, killed before Aquileia in 238. He was the son of a Goth by an Alan woman, and was brought up as a shepherd. During

the passage of the emperor Septimius Severus through Thrace, on his return from the East, he attracted the attention of that monarch by marvellous feats of strength and agility, as well as by his gigantic stature, being more than 8 ft. high, and eventually able to wear the bracelet of his wife as a ring on his finger. Admitted to the army, though a barbarian, he rose from rank to rank, gained the admiration of his fellow soldiers by valor equalling his strength, and after several reigns succeeded in supplanting the virtuous Alexander Severus, on whose assassination by the soldiers in Gaul he was proclaimed emperor (235). He appointed his son Maximus to the dignity of Cæsar. Though successful in his almost continual wars against the Germans, the imperial barbarian, who is said to have eaten 40 pounds of meat and drunk an amphora of wine a day, was tormented by a sense of insecurity, and in order to preserve his power perpetrated cruelties which surpassed those of his previous masters, Caracalla and Elagabalus. He spared none whom birth or merit exposed to suspicion. For alleged conspiracy, Magnus, a senator, was put to death, with 4,000 other persons. Simple death was regarded as a favor. His rapacity was no less disastrous than his cruelty, and he finally sunk under the general indignation of the provinces aroused by a wholesale confiscation of municipal property for the use of the imperial treasury. The insurrection broke out in Africa, where the two Gordians were proclaimed emperors. These perishing soon after, the senate proclaimed Maximus and Balbinus their successors. Maximin, who had his winter quarters on the lower Danube, hastened to Italy, crossed the Alps, and besieged Aquileia, but was soon murdered, together with his son, by his own soldiers.

MAXWELL, James Clerk, an English physicist, born in Edinburgh in 1831. He was educated at the academy and university of Edinburgh and Trinity college, Cambridge, graduating at the last institution in 1854. In 1856 he was appointed professor of natural philosophy in Marischal college, Aberdeen, and in 1860 in King's college, London, where he remained till 1865. In 1871 he became professor of experimental physics in the university of Cambridge. He has published "Essay on the Stability of the Motion of Saturn's Rings" (London, 1859), "Theory of Heat" (12mo, 1871), and "Treatise on Electricity and Magnetism" (2 vols. 8vo, 1873). The last named work possesses much interest beyond its mere value as a scientific treatise, being a translation into mathematical form of Faraday's "Experimental Researches in Electricity." Mr. Maxwell with many others regards Faraday's as a profound mathematical mind, although not familiar with technical mathematical language, and believes that many methods of research employed by mathematicians could be better expressed "in terms of ideas derived from Faraday than in their original form."

MAY (Lat. *Maius*), the fifth month in the Gregorian calendar, consisting of 31 days. Among the Romans it was sacred to Apollo, and almost every day was a festival. On the 9th, 11th, and 13th days was celebrated the festival of the *lemuria* in memory of the dead, and consequently it was believed that marriages contracted in this month would result fatally. There is also a French proverb: *Noces de Mai, noces de mort*. From the ancient *Floralia*, or festival in honor of Flora, celebrated from April 28 to May 2, is perhaps derived the mediæval and modern custom of observing May 1 (Mayday) with festive and floral rites. The druids also were accustomed to light large fires upon the summits of hills on the eve of May. Polydore Vergil says it was usual to adorn not only houses and gates, but also churches, with boughs and flowers. Hall mentions in his "Chronicle" that Henry VIII. rode a-Maying with Queen Catharine and many lords and ladies from Greenwich to the high ground of Shooter's hill.

MAY, Caroline, an American authoress, born in England. She is the daughter of the Rev. Edward Harrison May, for many years pastor of one of the Dutch Reformed churches of New York. She has edited "American Female Poets" (1848), with numerous biographical and critical notes; "Treasured Thoughts from Favorite Authors" (12mo, 1851); "The Woodbine" (1852), an annual; and has published "Poems" (1864), and "Hymns on the Collects" (1872). Miss May is also a painter and musician. She resides at Pelham, Westchester co., N. Y., on the grounds of Miss Bolton's "Priory."—Her brother, EDWARD H. MAY, is a painter of some celebrity in Paris.

MAY, Samuel Joseph, an American clergyman, born in Boston, Sept. 12, 1797, died in Syracuse, N. Y., July 1, 1871. He graduated at Harvard college in 1817, studied divinity at Cambridge, and in 1822 settled as a Unitarian minister at Brooklyn, Conn. He was a member of the convention which organized the national anti-slavery society in 1833, and signed the "Declaration of Sentiments." In 1835 he became general agent of the Massachusetts anti-slavery society, in which capacity he travelled and lectured extensively. In 1836 he became pastor of the Unitarian society in South Scituate, Mass., and from 1842 to 1844 was principal of the girls' normal school at Lexington, Mass. In 1845 he accepted the pastorate of the Unitarian society in Syracuse, N. Y., which he retained until three years before his death. He was always active in the cause of popular education, as well as in the promotion of charity. For his advocacy of emancipation his life was frequently in danger, and in January, 1861, he was mobbed and burned in effigy in Syracuse for attempting to hold an abolition convention. He published "Recollections of the Anti-Slavery Conflict" (Boston, 1868), and several addresses and essays.—See "Memoir of Samuel Joseph May" (Boston, 1873).

MAY, Sir Thomas Erskine, an English author, born in 1815. In 1831 he was appointed assistant librarian of the house of commons, and was gradually promoted until in 1871 he became clerk of the house. He was knighted in 1866. In 1844 he published a "Treatise on the Laws, Privileges, Proceedings, and Usage of Parliament," which is the acknowledged parliamentary text book, and has been often reprinted and translated into foreign languages. He has also published several other works on the practice and mode of procedure in the house of commons. In 1854 he collected and reduced to writing, for the first time, the "Rules, Orders, and Forms of Proceeding of the House of Commons," which were adopted and ordered to be printed by the house. In 1861-'3 he published "The Constitutional History of England since the Accession of George III., 1760-1860" (a continuation of Hallam's work on that subject), which was reprinted in the United States and translated into French and German, and of which a third edition with a supplementary chapter appeared in 1871. He has also published the "History of Democracy in Europe."

MAYAS, the race of Indians inhabiting Yucatan and some adjoining districts. By some ethnologists they are regarded as a distinct race, though the precise period of their arrival on the peninsula is unknown; by others as descended from the Toltecs, according to which theory the first immigration must have taken place between 1052 and 1200; and others still imagine them to be the resultant of two races, one from the islands of Hayti, Cuba, &c., and the other from the west (Toltecs?), under the guidance of Zamna, a priest, who named the different parts of the coast and the interior, and was the first to train the people in the arts of civilization. The last theory appears the most plausible, inasmuch as nearly all writers agree in crediting the Toltecs with the introduction of civilization into the peninsula. As to their rulers, Landa is of opinion that three brothers came from the west to Chichen Itza and ruled there; that after the death or departure of one, the two others became tyrannical and were slain; and that Cuculan (the Mexican Quetzalcoatl) reestablished order, founded Mayapan (a name afterward extended to the whole peninsula), and left the lordship to the house of the Cocomes, about the 10th century. From the south (Chiapas) came large tribes, the Tutuxiu (also Toltecs), who aided the natives to overthrow the Cocom dynasty and massacre the monarch of Mayapan, probably in the first half of the 15th century. The kingdom was then divided into upward of 40 petty seigniories, all tributary and submissive to the *batabe* or cacique of Mani. Large numbers migrated to the adjoining district of Peten, where they are known under the name of Itzaes. Landa, and since him Stephens, Squier, and many others, rank the Mayas among the most civilized of American nations, with an

alphabet and a literature, cultivating the soil, manufacturing, having sailing vessels, carrying on trade, using a medium of exchange, and erecting temples and other edifices of stone, which, from their size and profuse ornamentation in carved and colored figures and bassi rilievi, are, even in their ruined state (at Palenque, Uxmal, Chichen Itza, &c.), the most remarkable architectural relics in the western hemisphere. Orozco y Berra, Morelet, and other travellers and archaeologists, contend that the Toltecs alone could have been the builders of these edifices and cities; and Morelet strongly maintains this theory, which he bases upon the "indisputable analogy existing between these



Maya Alphabet.

ruins and the ancient monuments of Tula and Mitla, and the geographical position of the former, which spread over the line of Toltec emigration." Be this as it may, it is certain that the Maya language bears no relation to the Toltec, but is the principal branch of the Huasteco-Maya-Quiché family. Possibly the language of the immigrants from the West Indies prevailed to the exclusion of the Toltec, as the Maya has successfully resisted the influence of the Spanish tongue since the conquest. The Maya writing was of two kinds, one representing the letters of the alphabet, which lacks

the Spanish *d, f, g, q, r*, and *v*, the other expressing syllables by characters. Landa gives the first alphabet, some samples of the second, and the signs of the months, with their system of numerals, with the help of which scholars have been enabled to decipher some of the ancient Maya manuscripts still preserved in Europe, as the Troano, Dresden manuscript, &c. They are written on long strips of prepared inner bark, folded in book form, the lines reading from right to left or from bottom to top. The Maya abounds in monosyllables, elisions, and syncope; different meanings are given to the same word by tones. The plural is generally formed by adding *ob*, comparison by *il*. The first grammars were drawn up by Villalpando and Landa; an *Arte del idioma Maya*, by Gabriel de San Buenaventura, was printed at Mexico in 1560, and others followed. That of Pedro Beltran de Santa Rosa Maria (Mexico, 1746) contained the first dictionary. In recent times many works upon the Maya have been issued by the abbé Brasseur de Bourbourg, including *Gramática de la lengua Quiché*, drawn chiefly from the *Tesoro de las lenguas Quiché, Cakchiquel y Tzutuhil* of Francisco Ximenez (Paris, 1862), and *Dictionnaire, grammaire et chrestomathie de la langue Maya, précédés d'une étude sur le système graphique des indigènes du Yucatan (Mexique)* (Paris, 1872). His theories are not as readily accepted as the historical material he presents. A Maya dictionary by Dr. Behrend is now in press (1875).—The Mayas flattened the head of their infants, painted the face and body, and tattooed their persons; the women filed their teeth, and wore pieces of amber in the cartilage of the nose; both sexes wore ear rings. They bathed frequently for religious purposes, and always washed their hands and mouth after eating; but they used a drink like mead, rendered intoxicating by the infusion of a root, and both sexes drank to excess. They had drums and wind instruments, and though some of their dances were obscene, the women were chaste and modest. As money they used shells, pieces of copper, or cacao beans. Their religion, as administered by the *cheles* or priests, was a terrible system, the victims being slain with arrows, or cut open and flayed after the heart was extracted. Others were thrown down the sacred pit of Chichen Itza. In war they used arrows tipped with obsidian or teeth of fish, flint-headed spears, and copper hatchets. They had bucklers and defensive armor made of quilted cotton with salt inside. Their year was of 18 months, each with 20 days, and 5 days 6 hours over. They had a bissextile year.

MAY BUG. See COCKCHAFFER.

MAYENCE. See MENTZ.

MAYENNE, a N. W. department of France, formed from the old province of Maine, bordering on La Manche, Orne, Sarthe, Maine-et-Loire, and Ille-et-Vilaine; area, 1,996 sq. m.; pop. in 1872, 350,637. The surface is rugged and diversified. Iron, coal, and slate are

found. The river Mayenne traverses the department from N. to S., joins the Sarthe near Angers, department of Maine-et-Loire, taking the name of Maine, and 7 m. beyond falls into the Loire, after a course of 120 m. It is navigable from Laval, about 55 m. The climate is mild and healthful. The soil, except in the S. districts, is not fertile. The chief manufactures are linen, canvas, cotton, and paper. It is divided into the arrondissements of Château-Gontier, Laval, and Mayenne. Capital, Laval.

MAYER, Alfred Marshall, an American physicist, nephew of Brantz Mayer, born in Baltimore, Md., Nov. 13, 1836. He was educated at St. Mary's college, Baltimore. He has occupied the chair of physics, with chemistry or astronomy, in several institutions, as follows: University of Maryland, 1856-'8; Westminster college, Missouri, 1859-'61; Pennsylvania college, Gettysburg, 1865-'7; Lehigh university, Pennsylvania, 1867-'70; Stevens institute of technology, Hoboken, N. J., since 1871. In 1863-'4 he studied in the university of Paris. At Lehigh university he superintended the erection of an observatory, from which he made a series of observations of Jupiter. He was in charge of the party sent to observe the eclipse of the sun at Burlington, Iowa, Aug. 7, 1869, and took 41 perfect photographs of the eclipse. At Hoboken he began his researches in acoustics, in which he has made his most important discoveries; among these are: the measurement of the relative intensities of sounds of the same pitch; an acoustic pyrometer; the connection of the pitch of a sound with the duration of its residual sensation; the reflection of sound from flames and heated gases; that the fibrils of the antennæ of the mosquito are its auditory organs; the mechanism of hearing in mammals; and new methods of sonorous analysis. In 1873 he was one of the editors of the "American Journal of Science and Arts," from which he withdrew on account of weakness of sight, and visited England. Among his numerous scientific papers are: "Estimation of the Weights of very small Portions of Matter" (1858); "Lecture Notes on Physics" (1868); "Researches in Electro-magnetism" (1870 and 1873); "An Investigation of the Composite Nature of the Electric Discharge" (1874); and "Researches in Acoustics" (7 papers, 1871-'4).

MAYER, Brantz, an American author, born in Baltimore, Sept. 27, 1809. His father was a merchant of German birth, engaged in trade with the East Indies and Mexico, and for many years consul general of Württemberg in the United States. After graduating at St. Mary's college, Baltimore, he sailed for the East, visiting Java, Sumatra, and China, and returned in 1828. He practised law from 1832 till 1841, when he was appointed secretary of legation to Mexico, where he remained a year, and on his return edited for a short time the "Baltimore American" newspaper. In 1867 he was appointed a paymaster in the Uni-

ted States army, a post which he still held in 1874. Among his works are: "Mexico as it was and as it is" (1844; 3d ed., 1847); "History of the War between Mexico and the United States" (1848); "Mexico, Aztec, Spanish, and Republican" (1852); "Calvert and Penn, or the Growth of Civil and Religious Liberty in the United States" (1852); "Captain Canot, or Twenty Years in an African Slaver" (1854); "Observations on Mexican History and Archæology," in "Smithsonian Contributions" (1857); "Mexican Antiquities" (1858); and "Baltimore as it was and as it is" (1871). He has also contributed to the Maryland historical society the "Journal of Charles Carroll of Carrollton during his Mission to Canada," and "Tah-gah-jute, or Logan and Captain Michael Cresap."

MAYER, Johann Tobias, a German mathematician, born at Marbach, Württemberg, Feb. 17, 1723, died in Göttingen, Feb. 20, 1762. He gained a living when a mere youth by teaching mathematics. He early made himself known by scientific productions. The university of Göttingen in 1750 chose him its professor of mathematics, and appointed him director of its observatory. His "Zodiacal Catalogue," comprising 998 stars, is of high authority; and his "Lunar Tables," published in 1755, were deemed of such value by the English astronomer royal that the British parliament awarded his widow £3,000. The most important of his discoveries was the principle of the "repeating circle," employed by Borda in measuring the arc of the meridian.

MAYER, Julius Robert, a German physicist, born in Heilbronn, Württemberg, Nov. 25, 1814. He received his early education in the gymnasium of Heilbronn, and studied medicine at Tübingen, finishing his course in Munich and Paris. In 1840 he made a voyage to Java, and spent the summer of that year in Batavia. While there he observed that the venous blood of some of his patients had a singularly bright red color, and he came to the conclusion that it was due to the fact that a less amount of oxidation sufficed to keep up the temperature of the body in a hot climate than in a cold one. The darkness of the venous blood he regarded as the visible sign of the energy of the oxidation. His attention was drawn by this observation to the whole question of animal heat. One great principle of the physiological theory of combustion, he observes, is that under all circumstances the same amount of fuel yields by its perfect combustion the same amount of heat; that this law holds good for vital processes; and that hence the living body is incompetent to generate heat out of nothing. We are thus driven to the conclusion that it is the total heat generated within and without that is to be regarded as the true calorific effect of the matter oxidized in the body. From this again he inferred that the heat generated externally must stand in a fixed relation to the work expended

in its production. He then sought to express this relation numerically. In the beginning of 1842 he had made considerable progress, but having in the mean time become town physician of Heilbronn, he could devote but little time to purely scientific inquiry. He determined however to publish a preliminary notice of the work then accomplished, and he contributed to the May number of Liebig's *Annalen der Chemie und Pharmacie* a brief but remarkable paper entitled *Bemerkungen über die Kräfte der unbelebten Natur*, which contained the germ of his future labors. In 1845 he published a memoir entitled *Die organische Bewegung in ihrem Zusammenhange mit dem Stoffwechsel*, in which he expanded and illustrated the physical principles laid down in his first paper, applying them to organic nature. In 1848 appeared his essay, *Beiträge zur Dynamik des Himmels*, in which he applied the same principles to the heavenly bodies. In 1851 he published another essay, *Bemerkungen über das mechanische Aequivalent der Wärme*, in which he developed yet further the mechanical theory of heat. His general argument is that all the mechanical motions upon the earth and all the phenomena of vegetable and animal life are produced by the sun's heat, the source of all power. Nature stores up the light which streams earthward from the sun and casts it into a permanent form. To this end she has overspread the earth with organisms which, while living, take in the solar light, and by its consumption generate forces of another kind. These organisms are plants, and the vegetable world therefore constitutes the instrument whereby the wave motion of the sun is changed into the rigid form of chemical tension, and thus prepared for future use. The physical forces collected by plants become the property of animals. Animals consume vegetables and cause them to reunite with the atmospheric oxygen. Animal heat is thus produced, and also animal motion. Mayer thus grasped the mechanical theory of heat, illustrating it and applying it in the most diverse domains. He began with physical principles; he determined the numerical relation between heat and work; he revealed the source of the energies of the vegetable world, and showed the relationship of the heat of our fires to solar heat. He followed the energies which were potential in the vegetable up to their local exhaustion in the animal. He then drew attention to the great amount of heat generated by gravity where the force has sufficient distance to act through. He found that the gravitating force between the earth and sun was competent to generate an amount of heat equal to that obtainable from the combustion of 6,000 times the weight of the earth of solid coal. He saw that this was a power sufficient to produce the enormous temperature of the sun, and also to account for the primal molten condition of the earth; and he concludes that the light and heat of the sun

are maintained by the constant impact of meteoric matter. Similar conclusions in relation to the mechanical theory of heat were arrived at in England by Dr. James Prescott Joule almost contemporaneously with the investigations of Dr. Mayer; but there is no reason for supposing that either derived his inspiration from the other. Each was an independent creator of the theory. (See CORRELATION.) In the revolution of 1848 Dr. Mayer took what was called the side of order, which aroused against him the antagonism of many of his neighbors. His scientific labors were attacked, and this in connection with the loss of children threw him into an excited and sleepless condition. On May 28, 1850, being suddenly seized with a fit of delirium, he quit his bed and leaped from a second-story window, 30 ft. high, to the street below. He recovered from the shock, but his mind was seriously affected. After spending some time in an asylum he was fully restored to health, and he now (1875) resides in Heilbronn. A complete edition of his works has been published under the title *Die Mechanik der Wärme* (Stuttgart, 1867). In 1871 the Copley medal was awarded to him by the royal society of London.

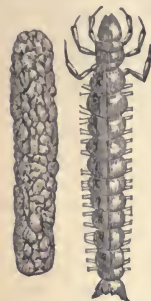
MAYER, Karl, a German pianist and composer, born in Clausthal in 1799, died in Dresden, July 2, 1862. His father was a clarinet virtuoso, and was attached to the military band of a regiment ordered to Russia in the campaign of 1812. He remained in Russia, and the young Karl received at Moscow lessons from the pianist John Field. In 1818 he went to Paris, and during 1819 resided at Brussels. After this he travelled through Germany, and then returned to Moscow, where, as well as at St. Petersburg, he was held in high esteem as a teacher. He eventually returned to Germany. He was one of the most graceful composers for the piano of his day, and his numbered works for that instrument are 351. His larger compositions consist of concertos and rondos for piano and orchestra.

MAYER, Karl Friedrich Hartmann, a German poet, born at Neckar-Bischofsheim, Württemberg, March 22, 1786, died in Tübingen, Feb. 25, 1870. He studied law at Tübingen, where he became chief councillor of justice. In 1833 he was a liberal member of the chamber. He was an intimate friend of Uhland, whose biography he published (Stuttgart, 1867). Several editions of his poems have appeared.

MAYFLY, an insect generally placed in the order *neuroptera*, with the dragon flies, ephemera, myrmeleon, and termites or white ants, forming the genus *phryganea* as restricted by Latreille. The jaws are hardly perceptible; the lower wings are broader than the upper, and longitudinally plaited; they have no sting nor piercer, and the antennæ are as long as the body; they undergo complete transformation, larvæ and pupæ living in the water and feeding on aquatic insects and plants. The eggs are laid on the leaves of willows and other trees

overhanging the water, attached by a viscid matter; the small six-footed larvæ, when hatched, fall into the water, and there form for themselves cases of bits of straw, wood, leaves, stones, and shells, cemented together by a glutinous silk; they are hence called case or cad-

dis worms; the larva protrudes its head and shoulders from the case when searching for food; the manner in which these cases are made, ballasted, and balanced affords a striking example of insect architectural ingenuity. (See Rennie's "Insect Architecture.") The pupa is incomplete, and is enclosed in the larva case, at one end of which is a silken grating through which the water for respiration is admitted and ejected; just before quitting the case the grating is cut through by a pair of curved



Mayfly—Larva and case.

mandibles, and the insect leaves the water by means of the four anterior legs, which are unconfin ed, to assume the perfect state. The flies as well as the larvæ are greedily eaten by fish, and are well known to anglers, who imitate the perfect insects by colored feathers as bait for trout, grayling, &c. Mayflies fly heavily, and generally alight on bushes near the water's edge; most of them are brown with cinereous, greenish, and yellowish markings; they include the willow, alder, green-tail, and dun flies, which cover the surface of the water during the cloudy days of spring, affording plentiful food for fish; as the season advances they appear chiefly in the morning and evening, and during the heat of summer are principally nocturnal. About 300 species are described, one of the largest of which is the *P. grandis* (Linn.) of Europe, nearly an inch long, with a spread of about 2 in.; the upper wings are brownish gray with cinereous spots, and the antennæ as long as the body. Kirby established the order *trichoptera* for these insects, which present some peculiarities connecting them with *lepidoptera*; the larvæ resemble the moths in making cases; the perfect insects have the wings hairy but scaleless, without reticulations, and the under ones folded longitudinally; the antennæ are like those of moths, and the tibiae are often armed with the two pairs of spurs observable in the latter; but they have not a spiral tongue, and the head has three single eyes as well as the usual compound ones; the abdomen is never furnished with terminal setæ. There are some of the *pyralides* or delta moths, in the larva state living in leafy cases under water, and feeding on aquatic plants, which seem to make a transition to the *trichoptera* or this division of the *neuroptera*.—Another neuropterous insect, of the subulicorn family and genus *ephemera* (Linn.), is also called mayfly; the lower wings are much smaller than the

upper, and both are carried perpendicularly; the abdomen is terminated by two or three setæ; the antennæ are short, and the body is soft, long, and tapering. These frail creatures appear in the winged state toward evening in summer, often in immense numbers; the *E. albipennis*, a European species, with white wings, occurs sometimes in such abundance in midsummer as to remind one of a snow storm. The larvæ are aquatic, and excavate burrows in the banks of streams under water, in which they are safe from fishes and yet amply supplied with food; after changing their skins several times they become nymphs, with the long caudal appendages and lateral fringes of the larvæ, but with rudimentary wing cases in addition; after attaining the winged state, they cast off a complete envelope of skin. Passing a year or two in their imperfect condition, they assume their perfect shape and sport for a few days, perhaps for a few hours only, in the summer day or evening. The fishermen of France call them *manna* from their furnishing abundant food for fish, covering the surface of the water with their countless swarms in August. (See Rennie's "Insect Transformations.") These are called day flies, and are imitated, as baits for fish. There are several in America.



Mayfly (*Ephemera*).

MAYHEW, the name of several brothers distinguished in contemporary English literature. **I. Henry**, born in London, Nov. 25, 1812, was educated at Westminster school, and afterward established himself in London as a literary man. In 1841 he assisted in founding the comic periodical "Punch" (which was preceded by "Figaro in London," also started by himself), and for some years was its chief editor. His principal publication is "London Labor and the London Poor," commenced in the columns of the London "Morning Chronicle" and published in 3 vols. 8vo (1861; new ed., 1868). In conjunction with his brothers Horace and Augustus, the former of whom was for many years attached to the staff of "Punch," he produced a series of humorous novels and Christmas stories by the "Brothers Mayhew," including "The Image of his Father" (1848); "The Greatest Plague of Life, or the Adventures of a Lady in Search of a Husband" (1849); "The Good Genius that turned Everything into Gold" (1851); "Whom to Marry and How to get Married" (1856); "The Magic of Kindness," "Acting Charades," &c. Under his own name he has published several interesting juvenile books, "Young Benjamin Franklin," "Boyhood of Martin Luther," "The Story of the Peasant-Boy Philosopher," founded on the life of James Ferguson, and "The Wonders of Science," founded on that of Sir Humphry

Davy. He is also author of "The Mormons, or Latter-Day Saints, a Contemporary History" (1852); "Upper Rhine," illustrated by Birket Foster (1858); "Lower Rhine" (1860); "German Life and Manners" (new ed., 1866); and, in conjunction with John Binny, "The Criminal Prisons of London" (1862). **II. Edward**, born in London in 1813, was during his youth the manager of a strolling company, and in that capacity wrote "Make your Wills," and other farces. He has published a valuable manual on the "Management and Treatment of Dogs," "Treatise on the Month of the Horse" (1849), and "The Illustrated Horse Doctor" (1860). **III. Thomas**, born in 1810, was one of the first to prepare cheap publications for the poorer classes, and started several "penny dictionaries," "penny grammars," and similar works, forming the "Penny National Library." He was at one time editor of the "Poor Man's Guardian," which during the agitation of the reform bill encountered the opposition of government in consequence of its radical opinions. **IV. Horace**, born in London in 1819, besides sharing largely in the authorship of the books by the "Brothers Mayhew," published several humorous works under his own name, including "Change for a Shilling," and "Model Men and Women" (1848); "The Toothache, imagined by Horace Mayhew, and designed by George Cruikshank" (1849); "Letters left at the Pastry Cook's" (1852); and "Wonderful People" (1856). He died April 30, 1872. **V. Augustus**, who had an equal share with Horace and Henry in the production of the "Brothers Mayhew" series, has

been an industrious contributor to periodical literature, and has published under his own name "Finest Girl in Bloomsbury" (1851); "Kitty Lamere" (1858); "Paved with Gold, or the Romance and Reality of the London Streets" (1858; 4th ed., 1872); "Faces for Fortune" (1866); and "Blow Hot and Blow Cold" (1869).

MAYHEW, Jonathan, an American clergyman, born in Martha's Vineyard, Mass., Oct. 8, 1720, died in Boston, July 9, 1766. He graduated at Harvard college in 1744, and in 1747 was ordained minister of the West church in Boston, a post which he filled during the remainder of his life. He was distinguished as a preacher and a writer of controversial tracts. His opposition to the proceedings of the British society for the propagation of the gospel in foreign parts and the introduction of bishops into the colonies involved him in a controversy with Dr. Apthorp and Dr. Secker, the archbishop of Canterbury. He cooperated with Otis and other early opponents of the arbitrary designs of the mother country, occasionally introducing his liberal opinions into his sermons with a boldness which ranked him among the ultra whigs. Among his published works are a volume of seven sermons (1749); "Christian Sobriety, in eight Sermons to Young Men;" and "Observations on the Charter and Conduct of the Society for Propagating the Gospel in Foreign Parts." A memoir of him was written by Alden Bradford (Boston, 1838).

MAYNOOTH, a market town of Ireland, county Kildare, on the Royal canal, 15 m. W. N. W. of Dublin; pop. in 1871, 2,091. It has a ruined



St. Patrick's College, Maynooth.

castle built in 1426 by John Fitzgerald, earl of Kildare, and is the seat of the royal college of St. Patrick, founded in 1795 by act of the Irish parliament for the education of Roman Catholics for the priesthood. About £8,000 was voted annually for its maintenance from 1808 to 1845, when £30,000 was appropriated

to repair and erect buildings, and the annual grant was raised to £26,360. By the Irish church act, July 26, 1869, this grant ceased after Jan. 1, 1871, and a compensation of £372,331 was voted. The college has an income of £460 per annum from the Dunboyne estates in the county of Meath. By the act

8 and 9 Victoria, cap. 25, the institution was placed on a new foundation, and endowed for the support and education of 500 students, and of 20 senior scholars on the Dunboyne foundation. Allowances are made to 250 members of the three higher classes and to the 20 Dunboyne scholars. Candidates over 16 years of age, and intended for the priesthood in Ireland, are admitted on the recommendation of their bishops, and no others can be received. The faculty consists of a president, vice president, four deans, a prefect of the Dunboyne establishment, who is also librarian, a bursar, four professors of moral and dogmatic theology, and one professor of each of the following branches: natural philosophy; sacred Scripture and Hebrew; ecclesiastical history; logic, metaphysics, and ethics; rhetoric and belles-lettres; humanity; English rhetoric and French; and the Irish language.

MAYO, a maritime county of Ireland, in the province of Connaught, bordering on Sligo, Roscommon, Galway, and the Atlantic ocean; area, 2,131 sq. m.; pop. in 1871, 245,855. The coasts are indented by numerous bays and harbors, the principal of which are Killala bay on the north, and Broadhaven, Blacksod, and Clew bays on the west. The surface toward the east is level and fertile, but the western districts are for the most part barren and mountainous, some of the summits attaining an elevation of more than 2,500 ft. The only important river is the Moy, but the lakes are numerous, the largest being Loughs Corrib, Mask, Conn, Cullin, and Carra, the two first named belonging in part to the county of Galway. The most important minerals are iron, marble, and slate; but the iron mines, though valuable, are not worked for want of fuel. Oats are the chief crop, but a large part of the land is devoted to pasturage. The principal manufactures are linens, flannels, woollen stockings, and straw hats. Chief towns, Castlebar (the capital), Ballina, and Westport.

MAYO. **I. Amory Dwight**, an American clergyman, born in Warwick, Mass., Jan. 31, 1823. He passed a year in Amherst college, then studied theology, was ordained, and was settled at Gloucester, Mass., over the Independent Christian church. Eight years afterward he removed to Cleveland, Ohio, and preached one year to the Congregational society of Liberal Christians. In 1855 he took charge of the first Congregational Unitarian society of Albany, and subsequently of a congregation in Cincinnati. He afterward became pastor of a church in Springfield, Mass., a post which he still occupied in 1874. He has contributed much to periodicals, and many of his writings in vindication of his peculiar religious tenets appeared in a serial publication, the Albany "Tracts for the Times." Among his works are: "The Balance" (Boston, 1847); "Graces and Powers of the Christian Life" (Boston, 1852); "Symbols of the Capital" (New York, 1859); and "Religion in Common Schools" (Cincinnati,

1869). He also prepared a selection from the writings of his wife, with a memoir (Boston, 1849). **II. Sarah C. (Edgerton)**, wife of the preceding, born at Shirley, Mass., in 1819, died in 1848. She was married in 1846. During nine years she edited "The Rose of Sharon," an annual, conducted "The Ladies' Repository," and contributed to various periodicals. She wrote "The Palfreys," "Ellen Clifford," and "Memoirs of Mrs. Julia W. Scott," and compiled "The Poetry of Women," "The Flower Vase," "Spring Flowers," "The Floral Fortune Teller," and "Fables of Flora."

MAYO, **Richard Southwell Bourke**, earl of, a British statesman, born in Dublin, Ireland, Feb. 21, 1822, assassinated at Port Blair, Andaman islands, Feb. 8, 1872. He graduated M. A. at Trinity college, Dublin, in 1844, made a tour through the north of Europe, and in 1845 published a narrative of his observations in St. Petersburg and Moscow. He was a member of parliament from 1847 to 1866, and chief secretary for Ireland from March to December, 1852, again from February, 1858, to June, 1859, and for the third time from July, 1866, to September, 1868, with a seat in the cabinet. On the death of his father, Aug. 12, 1867, he succeeded as sixth earl of Mayo. He was appointed governor general of India in the latter part of 1868, and arrived at Calcutta in January, 1869. His administration was distinguished by executive ability and by the introduction of many reforms. Early in 1872 he set out upon a tour of inspection of the British provinces in India, and had reached the penal settlement of Port Blair when a Mohammedan convict broke through the guards and stabbed him in the back, killing him instantly.

MAYO, **William Starbuck**, an American author, born in Ogdensburgh, N. Y., April 20, 1812. He studied medicine, and after practising for several years made a tour through the Barbary States and Spain. After his return he took up his residence in New York. His principal works are: "Flood and Field, or Tales of Battles on Sea and Land" (1844); "Kaloolah," purporting to be the autobiography of Jonathan Romer, describing his adventures in Africa (1849); "The Berber, or the Mountaineer of the Atlas," a romance of adventure similar to "Kaloolah" (1850); "Romance Dust from the Historic Placer," a collection of stories chiefly founded on historical incidents (1851); and "Never Again," a novel (1873).

MAYOR (Lat. *major*; Fr. *maire*), the chief municipal officer in a borough or corporate town. The office arose out of the immunities granted to free cities by sovereigns in the middle ages, and in England dates from the reign of Richard I., previous to which time the chief magistrate of a town was called portreeve or boroughreeve. In England mayors are addressed as "your worship," and those of London, Dublin, and York enjoy the prefix of lord to their titles by special royal grant. In France the *maire* is the first municipal officer in each

commune, and is charged with the preservation of public security, the preparation of statistics of marriages, births, &c., and with judicial power over certain minor offences. The chief executive officers of cities in the United States are termed mayors, and are elected annually or biennially by the citizens.

MAYOR OF THE PALACE (Lat. *major domus regia*, or *magister palatii*), an officer of state in France under the Merovingian kings, who originally exercised the functions of royal steward, having the management of the king's estates and the direction of his household. By degrees these functionaries usurped almost the entire power of the state, the kings remaining such only in name, whence they were called *rois fainéants* or lazy kings. This assumption of absolute power dates from the middle of the 7th century, when the administration of Austrasia, Neustria, and Burgundy was engrossed by their mayors, Grimoald, Archambaud, and Ebroin. Pepin of Héristal, mayor of Austrasia, from 688 to his death in 714 ruled France with absolute sway, and was succeeded by his natural son Charles Martel, whose son Pepin the Short, father of the emperor Charlemagne, took the title of king, and founded the Carolingian dynasty of French monarchs. The office then lost much of its importance, or was altogether abolished.

MAYSVILLE, a city and the capital of Mason co., Kentucky, situated on the Ohio river, at the terminus of the Maysville and Lexington railroad, 65 m. above Cincinnati, and 61 m. N. E. of Lexington; pop. in 1870, 4,705, of whom 681 were colored. It lies on a bend of the river, and is backed by a range of hills which give it a very attractive appearance. Among the public buildings are a handsome city hall, a court house, a substantial stone jail, and a hospital. The city has an active trade derived from N. E. Kentucky, and is one of the most extensive hemp markets in the United States. It contains three banks, two flour mills, two extensive plough factories, one cotton factory, and chair, coach, and wagon factories. There are several public schools, a high school, a convent, an academy, one tri-weekly and three weekly newspapers, and twelve churches. It was settled in 1784, and incorporated in 1833.

MAYWEED, a plant of the composite family, with so much the aspect of the chamomile that some botanists place it in the same genus as *anthemis cotula*, while others regard the fact that the ray flowers are neutral as sufficient to characterize a separate genus, *maruta*. The plant is a native of Europe, and has become extensively naturalized in this country; and while it is very common along roadsides and in barnyards, it is not an aggressive weed upon cultivated grounds. It is also known as dog's fennel and stinking chamomile; it has not only the appearance of chamomile, but similar properties, but accompanied by a nauseous odor, which does not prevent its occasional use in domestic medicine. It is said that the

fresh plant, especially if bruised, will cause blistering if applied to the skin. Its only importance is as an exceedingly common weed;



Mayweed (*Maruta cotula*).

and as it is an annual and easily exterminated, its presence is an index of careless cultivation.

MAZACA. See **CESAREA** (II.).

MAZARIN, Jules (Ital. MAZARINI, or MAZZARINO, GIULIO), cardinal, a French statesman, born at Piscina, in the kingdom of Naples, or according to some in Rome, July 14, 1602, died in Paris, March 9, 1661. He was of a noble Sicilian family, received his early education at Rome, and afterward studied law at the universities of Alcalá and Salamanca in Spain. In 1625 he was a captain in the papal army. Even at this early age he displayed remarkable diplomatic talent, and was employed in important negotiations with the French and Spanish commanders in Italy. Entering the civil service of the pope, he was attached to the suite of Cardinal Sacchetti, the papal ambassador at Turin. In 1629 the cardinal returned to Rome, leaving Mazarin at Turin, with the title of internuncio and full powers to conclude a peace. In this capacity he went to Lyons in 1630, where he was presented to Louis XIII., and subsequently to Cardinal Richelieu, who succeeded in attaching him to the interests of France. In 1634 Richelieu caused him to be made vice legate of Avignon, and in 1641 procured for him a cardinal's hat from Pope Urban VIII. After the death of Richelieu in December, 1642, Mazarin became a member of the council of state; and on the death of Louis XIII. in May, 1643, the regent Anne of Austria made him prime minister. He at first pursued a cautious policy, affecting great humility and moderation; but a powerful party was soon organized against him, headed by the duke of Beaufort, the prince of Conti, the duchess of Longueville, and De Retz, archbishop-coadjutor of Paris. The people being already heavily taxed, the parliament of

Paris refused to consent to a new impost, and the cardinal caused Blancmesnil, its president, and Broussel, one of its most popular members, to be arrested. Instigated by De Retz and the other leaders of the opposition, the citizens of Paris rose in insurrection in August, 1648, and thus began the civil war of the Fronde. Mazarin fled to St. Germain with the queen regent and the young king, and was proscribed by the parliament. Peace was restored March 11, 1649, chiefly through the influence of the great Condé, who, however, conducted himself with such arrogance that Mazarin caused him to be arrested and imprisoned, Jan. 18, 1650, together with the prince of Conti and the duke of Longueville. The parliament espoused the cause of the princes, and issued a decree of banishment against Mazarin. As the parliament was sustained by the people, the cardinal liberated the princes in 1651, and fled to Germany. His influence over the queen, to whom he is supposed to have been secretly married, was so great that he still governed the kingdom from his exile; and in 1652, the excitement against him having apparently subsided, he entered France at the head of an army of 6,000 men under the authority of a passport from the queen. The prince of Condé was at this time again in rebellion, and the young king Louis XIV., who had recently assumed his majority at the age of 13, was at Poitiers with his court, and toward that city Mazarin directed his march. The news of his return to France created great commotion in Paris. The parliament hastily assembled, decreed that the cardinal was a rebel, and ordered his magnificent library and other property to be sold, and from the proceeds of the sale 150,000 livres set apart as a reward to whoever should deliver him up dead or alive. Mazarin, regardless of these decrees, continued his march, and at the end of a month reached Poitiers, where he was received by the king and the court with the greatest demonstrations of delight. The civil war continued for some months longer, being carried on by the princes and the parliament on the pretext that the king was a prisoner in the hands of Mazarin, whose foreign birth made him peculiarly unpopular. At length the cardinal, finding that nearly all parties were weary of the contest and only needed an excuse for laying down their arms, tendered his resignation as prime minister, and withdrew from the court. The parliament then submitted, together with all the principal leaders of the Fronde except Condé, and the king returned to the capital amid the acclamations of the people. Louis immediately ordered Cardinal de Retz, the principal instigator of sedition, to be arrested and sent to prison at Vincennes. Mazarin, who had meanwhile taken command of the army on the frontier, and gained some successes over the Spaniards, seized the occasion to return to Paris. The king and the courtiers went out several miles to welcome him, and he entered the capital in triumph, in the same car-

riage with the king, amid general rejoicings. His first care after his return was for the public finances, which were in great disorder, and next for his own. His financial skill and his thrifty habits soon restored his fortunes, and he advanced those of his family, which included a number of beautiful and profligate nieces. (See MANCINI.) From his return to Paris till his death Mazarin ruled France with absolute power, the king quietly submitting to his guidance. His last great stroke of policy was his negotiation of the peace of the Pyrenees with Spain in 1659, and the marriage of Louis XIV. with the Spanish infanta, which was celebrated in the following year. Mazarin had accumulated during his administration 40,000,000 livres, an enormous sum at that time. On his deathbed his conscience troubled him about his property, and he gave it to the king, who after keeping it three days restored it, and it became the inheritance of his relatives. His "Letters" were published in Paris in 1745.

MAZATLAN, a maritime city of Mexico, in the state of Sinaloa, at the head of a bay at the entrance of the gulf of California, 530 m. N. W. of Mexico; pop. in 1867 (according to official reports), 11,681; in 1871, 12,706, of whom about 4,000 constitute a floating population, mostly merchants and traders, who in summer resort hither from Chihuahua, Sonora, Jalisco, Colima, and Durango. The upper part of the town, standing in front of rocky hills, is somewhat irregular; but that facing the bay contains some very good streets with handsome residences, mostly in the old Castilian style of architecture. There are five public squares, on the largest of which, the plaza de Armas, enclosed with railing, and embellished with orange trees, stand the chief public buildings. On another square nearer the beach are the custom house, the offices and residences of the commandant and captain of the port, and the public stores, all tastefully constructed. The American consul reported in 1873 that many of the houses were vacant, and some as well as the custom-house wharf greatly decayed, and that business was rapidly declining. Other reports, however, are more favorable. The climate is damp, and in summer excessively hot, the mean temperature from June to October being about 90° F.; while during the remainder of the year the temperature ranges from 70° to 75°, and frequent rains inundate the country, rendering travel almost impracticable. Silver mines abound in every direction, those which are worked on the largest scale being the property of Americans, and valued at \$2,000,000. Although the soil favors agriculture, the only products are cotton, corn, and beans, for home consumption. Such immense quantities of bananas are used in the town and its neighborhood that the local supply is quite insufficient, and the fruit is yearly imported to the value of about \$200,000. The chief articles of export are dyewoods, fine pearls, and gold and silver. Mining machinery

and implements, and sugar, fruits, and vegetables, are brought from San Francisco; and the various cotton fabrics, &c., come from Europe. The value of the exports for the year ending Sept. 30, 1873, was \$2,797,385, inclu-

Peter the Great; but when the Russians began to encroach on the liberties of his adopted country, he entered into secret connection with Stanislas Leszczynski of Poland, and subsequently into a league with Charles XII. of Sweden. These plans failed, Mazeppa being besieged by the Russians in his capital, Baturin, whence he escaped with an inconsiderable force. The defeat of Poltava (July 8, 1709) put it out of the power of Charles to aid him, and both fled to Turkey.

MAZZINI, Giuseppe, an Italian revolutionist, born in Genoa, June 28, 1805, died in Pisa, March 10, 1872. His father, who was a rich medical professor in the university of Genoa, gave him an excellent education. He learned the German, French, and English languages, studied jurisprudence, and before 1830



Mazatlan.

ding gold and silver bullion and coin to the amount of \$2,435,450; imports, \$1,276,000. The import duties for the same year amounted to \$758,300, and the export duties to \$137,670. The entrances and clearances for the year were 53 steamers and 26 sailing vessels, with an aggregate tonnage of 117,493. There are six public schools (two primary and one grammar school each for both sexes), with an attendance of 400 scholars in 1867; besides which there were 21 private establishments for the primary and higher branches. The number of adults unable to read or write was in the same year 5,761.

MAZEPPA, Jan, hetman of the Cossacks, born about 1645, died in Bender, Turkey, Sept. 22, 1709. He was the son of a Polish gentleman in Podolia, and became page at the court of John Casimir, king of Poland. On returning to his native province he formed an improper intimacy with a married lady, whose husband caused him, according to the common story, to be tied to a wild horse, which was then let loose on the plains and ran till he reached the country of the Cossacks, where Mazeppa was unbound, and kindly treated by the inhabitants. Another account says that Mazeppa was fastened to his own horse, which brought him back to his own door, and that, unable to endure the disgrace of his position, he left his country and took up his residence among the Cossacks. However he may have arrived among them, his abilities soon gave him great influence, and on the death in 1687 of the hetman Samoilovitch, whose secretary and adjutant he had been, he was chosen to the chief command. He attained to high favor with

published several liberal essays in the *Indicatore* of Genoa and the *Antologia* of Florence. In 1830 he joined the carbonari, and soon afterward was imprisoned six months in the citadel of Savona, and then expatriated. He went to Marseilles, at that time the headquarters of Italian exiles, where he organized a league called *la Giovine Italia*, or Young Italy, and established a journal of the same name. Among the most active emissaries of Young Italy were sailors, who scattered Mazzini's publications all over the peninsula. The movement soon attracted the attention of the authorities. A private correspondence in cipher was intercepted, and disclosed the purpose of raising guerilla bands, and other preparations for revolution. Extracts of this correspondence were published in the latter part of 1832 in the Roman journal *Notizie del Giorno*, and traced to Mazzini and his fellow conspirators. A circular inviting the coöperation of republican leaders in foreign countries was addressed, in February, 1833, to a journalist of Paris, and was signed Strozzi, the *nom de guerre* of Mazzini. His name was associated with political and military conspiracies which were discovered in Piedmont in 1833, and with their ramifications in Naples and other parts of Italy. After continuing for some time to issue his journal from a hiding place in Marseilles, he was at length compelled to leave the French territory and to seek refuge in Switzerland, where, in connection with Polish, German, and other Italian refugees, he planned an expedition to seize the fortress of St. Julien in Savoy, and the small town of Annecy, which commanded the road to Chambéry, while an-

other wing of the revolutionists, under Ramorino, was to advance from Les Échelles to unite at Chambéry, and to organize from that place military operations against Piedmont. The attack was made Feb. 1, 1834, at the frontier of Savoy, upon a few custom-house officers; the custom house was destroyed, and the insurgents advanced to the village of Annemasse, where a proclamation signed by Mazzini, Melegari, and Jacopo Ruffini, announced the formation of a provisional government at St. Julien; but it had no effect except to afford opportunities of smuggling during the confusion. The enterprise failed entirely. Sentence of death in *contumaciam* was passed by the Sardinian courts upon Mazzini, who however remained unmolested in Switzerland. Many of those implicated in the Savoy expedition were expelled from Switzerland, particularly the Polish refugees. But before their departure Mazzini obtained the coöperation of the principal representatives of the various nationalities in the organization of a new association to be called Young Europe. "Young Italy," "Young Poland," &c., appointed delegates, who on April 15, 1834, solemnly agreed to abide by the political, social, and religious platform which was laid down by Mazzini. The main object of Young Europe, according to Mazzini, was to lay the foundation for a universal development of thought and action, which would lead to the discovery and practical application of the divine laws of human government. Mazzini defined the league as the young Europe of the people, which was to supplant the old Europe of kings; as a conflict between the modern principles of freedom and the mediæval system of servitude, between the modern sentiments of equality and the old spirit of caste, monopoly, and privileges; and as a triumph of new religious aspirations and ideas over a decaying ecclesiasticism. The social application of Mazzini's principles is fully explained in his work, *Foi et avenir* (Bienne, 1835). Dissensions between Mazzini and the "Young Switzerland" (in whose interest a journal of that name had been published at Bienne chiefly under his influence) and "Young Germany" parties led him to withdraw from the central committee of Young Europe, and also of the Young Italy league, but without relaxing his zeal for the furtherance of the ends of both of these associations, of which he continued the principal leader. With the exception of a brief term of arrest in 1835, Mazzini was not interrupted in his agitation in Switzerland till 1837, when the Swiss authorities requested him to leave, and he went to London. His numerous partisans and friends continued the secret political agitation of Italy, while Mazzini labored by writing and by public addresses in the meetings of the Poles, Italians, or other oppressed nationalities in London. He wrote articles for various periodicals, among which are papers on Byron and Goethe, George Sand, Victor Hugo and Lamar-

tine, Thiers and Carlyle, on Fourierism and communism, and on Italian and German music. Besides publications, in journals and in pamphlets, on the political condition of Italy and other European states, he wrote in behalf of a comprehensive system of popular education, in the Italian journal *Apostolato Popolare*, which he published in London from 1840 to 1843. In 1842 he wrote a preface to a new edition of Dante's *Divina Commedia*, and prepared a complete edition of the works of Ugo Foscolo. He founded in London in 1840 a Sunday school for poor Italian children, and officiated as one of the teachers.—The tragic fate of the brothers Bandiera called public attention to Mazzini in 1844, he being considered as the inspiring spirit who had led those men to make the daring attempt upon the Austrian fleet which cost them their lives, although Mazzini had in reality opposed that particular movement. At the same time the English home secretary, Sir James Graham, was detected in having intercepted and opened letters addressed to Mazzini, which led to the discovery and suppression of the Bandiera conspiracy. There was a general cry of indignation against this violation of the post office, and the proceedings which the despotic powers wished the English government to institute against the Italian refugees fell to the ground. After protesting in 1846 against the enlistment of Swiss soldiers for the papal army, and against the annihilation of the republic of Cracow, he founded in 1847 an "international league of peoples," the principal object of which was to enlighten the people of England upon foreign politics, and to diffuse principles of self-government among the nations of Europe. At the end of 1847 he went to Paris to confer with other leaders in regard to the growing revolutionary feeling in Italy, but soon returned to London, where the revolution of February, 1848, took him by surprise. He returned at once to Paris, where he had an interview with Gioberti, Mamiani, and other leaders of the constitutional party. Mazzini was opposed to the annexation of the smaller Italian states to Sardinia, which was eventually proposed by the others. In March he issued an address to the people of Lombardy, congratulating them upon the success of their revolution, and soon returned to Italy, after an exile of 17 years. But his exertions in behalf of national independence were neutralized by the vacillating rival policy of Charles Albert, who had begun his campaign against the Austrians. After being foiled in Milan, and endeavoring in vain to raise the standard of revolution in other parts of Italy, Mazzini offered to enlist as a common soldier under Garibaldi, whose vanguard was on the point of advancing from Monza to Bergamo, when the capitulation of Milan to the Austrians (Aug. 5) led to the disbandment of the patriots, and Mazzini took refuge in Switzerland. Shortly after his arrival there, the news of the rising in Tuscany was received, together with the continued resistance

of Venice, which from the beginning had acted in accordance with his republican views under the lead of Manin, and encouraged him to proceed to Florence. Here he became a member of the provisional government, and was sent as deputy to the Roman republic, which had been proclaimed in February, 1849. He was elected a triumvir by the Romans, and became the ruling spirit of the republic, which was soon suppressed by French intervention. Mazzini went to Lausanne, where he continued the journal *L'Italia del Popolo*, which he had commenced at Milan. He remained for some time in Switzerland, organizing there a new national committee for continuing his agitations. Returning to London, he united his efforts with those of Ledru-Rollin, Kossuth, Arnold Ruge, and other revolutionary leaders. His name was associated with the dagger insurrection in Milan (Feb. 6, 1853), started by young enthusiasts who were led on by the inflammatory zeal of Mazzini, and promptly suppressed by the Austrian government. Orsini, formerly one of his most active partisans, in his memoirs published at Edinburgh in 1857, reproached Mazzini with recklessness and disregard of the lives of his friends. The latter, however, persisted in his propagandism; and notwithstanding the disapprobation of Manin and of other republican leaders, he again instigated an insurrection in Sardinia in 1857, and went to Genoa to superintend it. His followers seized Fort Diamante in the night of June 29; but as the people did not join the movement, Mazzini was compelled to abandon the enterprise. His friends who attempted similar outbreaks at Leghorn and Naples fell into the hands of the government, including those captured on board the steamer Cagliari, and were put to death or imprisoned, while Mazzini himself retired to his place of concealment near Geneva, and afterward returned to London, where he published "The late Insurrection defended by Joseph Mazzini" (1858). In January, 1858, his name was unjustly associated with Orsini's in the attempt to assassinate Napoleon III. At the end of that year he established in London a weekly journal, entitled *Pensiero ed Azione*. During the war of 1859 in Lombardy, he constantly resisted the idea that Italy could be benefited by the intervention of Napoleon III.; but he was warmly interested in the subsequent efforts to unify Italy, though he wanted it to be republican as well as united. In September, 1862, he published a manifesto to the people of Italy. In 1865 he was elected to the Italian parliament, but his election was annulled. After 1870 he resided principally at Genoa and Pisa. He was buried at Genoa, and it was estimated that 80,000 people witnessed his funeral. In addition to his literary works above noticed, he published *L'Italie, l'Autriche et le pape* (English ed., London, 1845); *Le pape au XIX^e siècle* (Paris, 1850); "Royalty and Republicanism in Italy" (London, 1850), translated into French with a preface by George

Sand; "The War and the Commune" (1871), and other pamphlets. There are editions of his works in Italian (12 vols., Milan, 1861 *et seq.*) and English, "Life and Writings of Mazzini" (6 vols., London, 1864-'70).—See *Mazzini jugé par lui-même et par les siens*, by Jules de Breval (Paris, 1853; translated into English); his "Life" by Simoni (1870); and "Joseph Mazzini, a Memoir," by E. H. V., with two essays by Mazzini (London, 1874).

MAZZOLINI, Lodovico, an Italian painter, born in Ferrara about 1481, died there about 1530. He was a pupil of Lorenzo Costa, and in small pictures, particularly his miniature altarpieces, attained great excellence. His architectural backgrounds are especially admired. His works are not numerous.

MAZZUCHELLI, Giovanni Maria, count, an Italian jurist, antiquary, and biographer, born in Brescia, Oct. 28, 1707, died there, Nov. 19, 1765. He was educated at Bologna, and afterward became keeper of the Quirinian library in his native city, where he devoted himself to Italian antiquities and biographical literature. He wrote *Notizie storiche e critiche intorno alla vita, alle invenzioni ed agli scritti di Archimede Siracusano* (Brescia, 1737); *Gli scrittori d'Italia, cioè notizie storiche e critiche intorno alle vite ed agli scritti dei letterati italiani* (2 vols. fol., in 6 parts, 1753-'63, not complete); and many other works. He left a vast collection of casts and medals, afterward engraved and published.

MAZZUOLA, Francesco. See PARMEGIANO.

MEAD, Larkin Goldsmith, an American sculptor, born in Chesterfield, N. H., Jan. 3, 1835. In 1852 he went to Brooklyn, N. Y., where for three years he was a pupil of Henry Kirke Brown. At Brattleboro, Vt., he modelled in snow a statue of the "Recording Angel," cut in marble in 1855. In 1857 he executed the colossal statue "Vermont," which crowns the dome of the state house, and in 1861 the statue of Ethan Allen, which stands in the portico. In 1862 he went to Florence, and produced the statuettes "Echo," "Sappho," "Joseph, the Shepherd," "The Mountain Boy," and a bust of "Echo." His first elaborate work in Italy was a group, "The Returned Soldier," executed in 1866. From 1868 to 1874 he was occupied upon the groups "Columbus's Last Appeal to Queen Isabella," and "America" for the soldiers' monument at St. Johnsbury, Vt., and executed the statue and corner figures for the Lincoln monument at Springfield, Ill., unveiled Oct. 15, 1874. Besides portrait busts, he has modelled "Venice, the Bride of the Sea," and "The Discovery of America," and in 1874 he completed for the state of Vermont a statue of Ethan Allen, to be placed in the old hall of representatives in Washington.

MEAD, Richard, an English physician, born at Stepney, near London, in 1675, died in London, Feb. 16, 1754. He studied at Utrecht, Leyden, and Padua. In 1703 he was elected a member of the royal society, and in the same

year was chosen physician of St. Thomas's hospital. In 1711 he was appointed anatomical lecturer to surgeons' hall, and in 1714 removed to London. In 1727 he was nominated physician to George II. He made valuable collections of books, antiquities, and works of art. His principal work was *Medicina Sacra* (London, 1748; translated into English, 1755), in which he maintains that demoniacal possessions were a species of insanity. His "Medical Works" were published in 1762 (4to, London).

MEADE, a N. county of Kentucky, on the Ohio river, drained by Otter and Spring creeks and other tributaries of the Ohio; area, about 400 sq. m.; pop. in 1870, 9,485, of whom 1,294 were colored. It has an undulating surface and fertile soil. The chief productions in 1870 were 67,691 bushels of wheat, 464,674 of Indian corn, 122,136 of oats, 40,662 of potatoes, 539,000 lbs. of tobacco, 22,656 of wool, 94,440 of butter, and 2,437 tons of hay. There were 3,209 horses, 1,791 milch cows, 3,248 other cattle, 7,460 sheep, and 18,170 swine; 1 cotton factory, 5 flour mills, 4 saw mills, 1 distillery, and 3 wool-carding and cloth-dressing establishments. Capital, Brandenburg.

MEADE. I. Richard Kidder, an American revolutionary soldier, born in Nansemond co., Va., about 1750, died in Frederick (now Clarke) co. in the early part of the 19th century. He was educated at Harrow school in England, and soon after his return to Virginia embarked in the revolutionary contest. In December, 1775, he commanded a company at the battle of the Great Bridge near Norfolk, the first fought in the state, and soon after he was appointed by Washington one of his confidential aides, in which capacity, with the rank of colonel, he rendered signal service throughout the war. He was with the commander-in-chief in all his great battles, and superintended the execution of Major André. The latter part of his life was passed in Frederick co., occupied with agricultural pursuits. **II. William**, an American bishop, son of the preceding, born in Frederick (now Clarke) co., Va., Nov. 11, 1789, died at his residence near Millwood, Clarke co., March 14, 1862. He graduated at Princeton college in 1808, and three years later was ordained to the ministry of the Protestant Episcopal church. In 1813-'14 he was active in procuring the election of Dr. Moore of New York as bishop of Virginia, and contributed materially to the establishment of a diocesan theological seminary at Alexandria, and various educational and missionary societies. In 1829 he was unanimously elected assistant bishop of Virginia, and in August of that year was consecrated in Philadelphia. He thenceforth assumed the chief care of the diocese, and in 1841, upon the death of Bishop Moore, became bishop. Ill health soon compelled him to ask for an assistant, who was provided in 1842 in the person of Dr. John Johns of Baltimore. He was for several years the acknowledged head of the evangelical branch of the Protestant Episcopal

church in the United States. His publications comprise "Family Prayer" (Alexandria, 1834); "Lectures on the Pastoral Office;" "Lectures to Students" (New York, 1849); and "Old Churches, Ministers, and Families in Virginia" (2 vols., Philadelphia, 1856). His life has been written by Bishop Johns (Baltimore, 1868).

MEADE. I. Richard Worsam, an American merchant, born in Chester co., Pa., June 23, 1778, died in Washington, D. C., in 1828. He was a son of George Meade, a Philadelphia merchant, who was active in the opposition to the stamp act, and made the continental government a present of \$10,000 in gold. Richard went to Cadiz, Spain, in 1803, as a merchant and ship owner, and from 1805 to 1816 was United States navy agent. During the peninsular war he imported immense quantities of supplies into the port of Cadiz, and frustrated Victor's attempt to starve out the allied garrison. In 1810 his vessels carried thither 250,000 barrels of flour. In 1815 he incurred the ill will of certain members of the Spanish council of war, and on May 2, 1816, was imprisoned in the castle of Santa Catalina, where he remained two years, and was then released at the demand of the United States government. The case which has since become celebrated as the Meade claim grew out of the losses incurred by him at this time, and the ruin of his business consequent upon his long imprisonment. In 1819 a special tribunal appointed by the Spanish government awarded him a certificate of debt, which was signed by the king, for \$491,153 62. In 1822 the commission appointed at Washington to consider such claims declined to receive this certificate, and demanded the original vouchers; but before these could be procured the session expired, and the fund was distributed among the other claimants. Subsequent attempts to get a rehearing of the case have all been fruitless, though the most celebrated lawyers were retained, including Webster, Clay, and Choate. Mr. Meade had the finest private gallery of paintings and statuary in the country; it contained the only bust of Washington taken from life; and he is said to have been the first importer of merino sheep and sherry wine into the United States. **II. George Gordon**, an American general, son of the preceding, born in Cadiz, Spain, Dec. 30, 1815, died in Philadelphia, Nov. 6, 1872. He graduated at West Point in 1835, served in the Florida war, and resigned Oct. 26, 1836. From 1837 to 1842 he was an assistant engineer in the government survey of the delta of the Mississippi, the Texas boundary, and the N. E. boundary of the United States. On May 19, 1842, he was reappointed in the army as second lieutenant of topographical engineers. He served through the war with Mexico, was attached to the staff of Gen. Taylor and afterward of Gen. Scott, distinguished himself at Palo Alto, Resaca de la Palma, and Monterey, was brevetted first lieutenant for gallant conduct, and on his return was presented with a

sword by citizens of Philadelphia. He was made captain of engineers in 1856, and was in charge of the surveys on the northern lakes till 1861. He was commissioned brigadier general of volunteers, Aug. 31, 1861, and took part in the action of Dranesville, Va., Dec. 20; at Mechanicsville, June 26, 1862; at Cold Harbor, June 27; and at Frazier's farm, June 30, where he was severely wounded. (See CHICKAHOMINY.) On June 18, 1862, he was made major of topographical engineers. He was engaged in the second battle of Bull Run, Aug. 29, 30; commanded a corps of the army of the Potomac in the Maryland campaign; was in the battles of South Mountain and Antietam in September; and was made major general of volunteers Nov. 29. At Antietam he was slightly wounded and had two horses shot under him. From December, 1862, to June 28, 1863, he was in command of the first corps and afterward of the fifth corps of the army of the Potomac, and was engaged at Fredericksburg and at Chancellorsville. On June 28, 1863, he was suddenly called to succeed Gen. Hooker in command of the army of the Potomac; and on July 1-3 he fought the battle of Gettysburg. (See GETTYSBURG.) He was made brigadier general in the United States army July 3. From October to December he participated in several minor actions in Virginia. From May 4, 1864, to April 9, 1865, he was, under Gen. Grant, in the immediate command of the army of the Potomac, from the battle in the Wilderness down to the capture of Petersburg and the surrender of Lee. He was made major general in the United States army, Aug. 18, 1864. On Jan. 28, 1866, he received the thanks of congress "for the skill and heroic valor with which at Gettysburg he repulsed, defeated, and drove back, broken and dispirited, beyond the Rappahannock, the veteran army of the rebellion." From July 1, 1865, to Aug. 6, 1866, he was in command of the military division of the Atlantic, in 1866-'7 of the department of the East, and subsequently of the third military district, comprising Georgia, Florida, and Alabama, with headquarters at Philadelphia. He became a member of the historical society of Pennsylvania in 1863, and of the Philadelphia academy of natural sciences in 1865, in which year he received the degree of LL. D. from Harvard university. He died in a house which his fellow citizens presented to his wife, and after his death a fund of \$100,000 was subscribed for his family.

MEADOW LARK, a starling, of the American genus *sturnella* (Vieillot). The body is thick and stout, the legs large, with hind toes reaching beyond the tail, which is short, even, and of narrow pointed feathers; the bill is nearly straight, and three times as long as high; inner lateral toe longer than the outer; hind claw nearly twice as long as the middle; feathers of head stiffened, the shafts above extended into a black bristle. The common species (*S. magna*, Swains.) is about 11 in. long, with an

extent of wing of 16, and the bill $1\frac{1}{4}$ in.; the color above is dark brown, each feather with a brownish white margin and a pale reddish brown terminal spot; wings and tail with dark brown bars; yellow beneath, with a black pectoral crescent; sides, rump, and tibiae pale



Meadow Lark (*Sturnella magna*).

reddish brown, with blackish streaks; a light median and superciliary stripe, yellow in front of the eye, and a black line behind. It is found in the eastern United States to the high central plains, extending perhaps as far south as Mexico. It is abundant in the southern states in the winter, whence it proceeds northward as far as Maine to breed, returning in the autumn in small flocks; the flight is generally short, unsteady, and at a moderate elevation; the notes at early morning are loud and melodious. The males are very pugnacious in breeding time; the nest is made of grasses in a hollow of the ground, and is covered over like an oven; both sexes incubate; the eggs, four or five, are white, with reddish brown spots at the larger end; the young are hatched about the end of June in the middle states. The meadow lark is the friend of the farmer in its destruction of injurious larvæ, but it sometimes pulls up the young corn, grain, and rice; it occasionally kills small birds, especially in confinement. In autumn and winter meadow larks are fat, and are sought by sportsmen; the flesh of the young is esteemed as food. On the Pacific coast is found a variety nearly resembling the other, but rather paler in tint, with the yellow on the chin and throat extending on the sides of the lower jaw. This bird is related to the starlings of Europe, of the genus *sturnus* (Linn.)

MEADOW MOUSE, the common name of the small rodents of the genus *arvicola* (Lacép.). The molars are $\frac{3}{4}$ - $\frac{3}{4}$, and rootless; the ears are short, nearly hidden in the fur; the muzzle is broad and rounded; the tail shorter than the body, cylindrical and hairy, soles naked anteriorly; the skull short, deep, and broad; whiskers in five horizontal series. The common meadow mouse of this country (*A. riparia*, Ord) is $4\frac{1}{2}$ in. long, and the tail about $1\frac{1}{2}$; the feet large and scaly; hair rather short; the eyes small, the thumb of the fore foot obsolete, and mammae four inguinal and four pectoral; the color above is dark brown, varied with reddish and yellowish brown; ashy plum-

beous below; tail and feet dusky. Many other species are described in vol. viii. of the report on the "Pacific Railroad Survey." The European species are called also *campagnols* and *voles*; the largest is the *hypudæus amphibius* (Ill.), which is aquatic, inhabiting the banks of streams and digging in the marshes for roots. The campagnol (*H. arvalis*, Ill.), of the size of a mouse, is yellowish gray above and whitish gray below; it lives in holes dug in the ground, in which it collects food for the winter. The economic meadow mouse (*H. æconomus*, Ill.) lives in Siberia, laying up ample winter stores, and sometimes migrating in large troops like the lemmings.—The meadow mice are spread over the northern hemisphere of America, Europe, and Asia, as yet not having been found in South America and Africa; they are abundant in the mossy swamps in the vicinity of the arctic circle. Some are aquatic, having the antitragus of the ear so developed as to act as a valve under water; others live in dry places and high lands, where they do much mischief by gnawing the bark of trees



Campaniol (*Hypudæus arvalis*).

and destroying grain and fruit; they do not climb, and are not dormant in winter, but retreat at that time to their well stored burrows. They are very prolific, and hence are often the source of considerable loss to the farmer; in 1818 and 1819 most of the harvest of Holland, and in 1837 of that of an entire province of Italy, was destroyed by them; in a German province in 1822, 1,500,000 were captured in 14 days. These animals in their turn furnish a supply of food to carnivorous mammals, birds, and reptiles. For an account of their habits, see Audubon and Bachman's "Quadrupeds of North America."

MEADOW SAFFRON. See COLCHICUM.

MEADVILLE, a city and the capital of Crawford co., Pennsylvania, on the E. bank of French creek, and on the Atlantic and Great Western railroad at the junction of the Franklin branch, 82 m. N. by W. of Pittsburgh and 34 m. S. of Erie; pop. in 1850, 2,578; in 1860, 3,702; in 1870, 7,103. It is situated in the midst of a fertile country, and has an extensive trade with the oil regions. Its manufac-

tures are important, the chief establishments being machine works and woollen mills. There are also paper mills, an edge-tool factory, &c. The business portion is compactly built. In the suburbs is Greendale cemetery, well laid out. The city contains a handsome court house, a state arsenal, an opera house, two national banks with a joint capital of \$300,000, two savings banks, 19 graded public schools, including a high school, a public library with 2,500 volumes, a daily and three weekly newspapers, and 15 churches. Allegheny college occupies three buildings on a hill N. of the city. It was founded in 1815, and since 1833 has been under the direction of the Methodist Episcopal church. It is open to both sexes, and in 1873-'4 had 6 instructors, 40 preparatory and 64 collegiate students, and libraries containing 12,000 volumes. The Meadville theological school, under the control of the Unitarians, was established in 1844, and in 1873-'4 had 4 resident professors, 7 other instructors, 21 students, and a library of 12,000 volumes. Meadville was founded in 1789.

MEAGHER, a central county of Montana, bounded W. by the Missouri river; area, 7,650 sq. m.; pop. in 1870, 1,387. It is drained by Mussel Shell river and other affluents of the Missouri. There is some arable land, but gold mining is the chief industry. The census of 1870 returns 11 hydraulic and 93 placer mines as in operation. The chief productions were 26,771 bushels of wheat, 14,501 of oats, 11,324 of barley, 6,419 of potatoes, 19,594 lbs. of butter, and 1,763 tons of hay. There were 237 horses, 1,008 milch cows, 1,960 other cattle, and 436 swine. Capital, Diamond City.

MEAGHER, Thomas Francis, an Irish revolutionist, born in Waterford, Aug. 3, 1823, drowned in the upper Missouri, near Fort Benton, Montana, July 1, 1867. He was educated at Roman Catholic colleges in Ireland and England, and studied law in Dublin, where he became the leader of the Young Ireland party. In 1846 he assisted in organizing the Irish confederation. On the overthrow of Louis Philippe in 1848, Meagher was sent at the head of a delegation to Paris to congratulate the French republican leaders. Soon after his return he was arrested for sedition, and released on bail, but was rearrested on a charge of high treason, found guilty, and received a sentence of death, which was commuted to transportation for life to Tasmania. From there he escaped, arrived in New York in May, 1852, and spent two years in lecturing on Irish independence in the principal cities of the United States. In 1855 he was admitted to the bar in New York, and in 1856 edited the "Irish News." In 1861 he joined the 69th New York regiment, of which he was acting major at the first battle of Bull Run. After the close of its three months' term of service he returned to New York, organized the Irish brigade, was colonel of the first regiment, and on the acceptance of the brigade was

put in command and made brigadier general of volunteers, Feb. 3, 1862. He was engaged in the battles before Richmond, at Antietam, at Fredericksburg, where he was wounded, and at Chancellorsville. In May, 1863, he resigned, but early in 1864 he was recommissioned and was assigned to the command of the district of the Etowah, including portions of Tennessee and Georgia, where he performed valuable services till January, 1865. After being mustered out of service he was appointed secretary of Montana territory, and in September, 1866, the governor appointed him acting governor in his absence. Meagher was traveling to take measures to protect settlers from Indian hostilities when he fell from the deck of a steamboat and perished. He published "Speeches on the Legislative Independence of Ireland" (12mo, New York, 1853), and "Last Days of the 69th New York Regiment in Virginia" (8vo, 1861).

MEAL WORM, the name given in Europe to the larva of a black heteromorous beetle, the *tenebrio molitor* (Linn.). The perfect insect, about two thirds of an inch long, appears in the evening in the least frequented parts of dwellings, in flour mills, bake houses, and pantries. The larva is more than an inch long, cylindrical, scaly, and of an ochrey yellow color; it is destructive to flour and meal, and to articles made from them; it is said to remain two years in this condition, and occasionally to have been eaten and rejected from the human stomach; it forms a favorite food for the domesticated nightingale.—The name of meal worm



Meal Worm Moth (*Pyralis farinalis*).

is given in New England to the larva of a small delta moth (*pyralis farinalis*, Harr.). The moth is often seen on the ceiling of rooms, resting with its tail curved over the back; the fore wings are long and narrow, and cover the hind ones when at rest; they are light brown, crossed by two curved white lines, and have a dark chocolate spot at the base and tip of each. The larvæ are long and slender, tapering at each end, naked, and with numerous legs; they are often seen in flour barrels, meal chests, and similar places.—Some of the larvæ of the moths of the genus *tinæa* make a thick whitish gray web over corn and meal.

MEALY BUG, a very destructive insect in greenhouses, of the order *hemiptera*, and family *coccidae* or bark lice, the *coccus Adonidum* (Linn.). The perfect insects resemble small scales; the reddish larvæ are small, but very active, flat and oval in shape; the females have a beak with which they pump up the juices of plants; they fix themselves from time to time for the purpose of changing their skin, when they cover themselves with a white, powdery, cottony substance, which has given them their common name. Several broods are produced

in a year, which cause great annoyance in hot-houses; the eggs are deposited in a similar cottony material. In the natural state many are destroyed by ichneumon parasites and are devoured by birds. Alkaline washes are found most effectual in checking their ravages, both within and out of the greenhouse.

MEANDRINA. See CORAL.

MEARIM, a river of Brazil, rising in the central portion of Maranhão, and flowing N. to lat. 3° 20' S., where it unites with the Pindaré to form the Maranhão, at the mouth of which is the island of San Luiz. Brazilians call the entire stream, from its source to the sea, Mearim. This river has so strong a current that the tide, after long resistance, rises with a furious bore (*pororoco*), like that which occurs at the mouth of the Amazon, traversing in 15 minutes a distance usually requiring nine hours. The Mearim is navigated by steamers.

MEARNS, The. See KINCARDINESHIRE.

MEASLES (*rubeola*, *morbilli*), a contagious exanthematous fever, attended with a characteristic eruption. Up to the latter part of the last century measles and scarlet fever were confounded together, or at least were esteemed, like simple and confluent smallpox, to be mere varieties of a common disease. Measles commences with the ordinary symptoms of fever, chilliness, loss of appetite, and lassitude, succeeded by heat of the skin, thirst, and frequency of pulse; but in addition to these, the attack is almost invariably attended with inflammation of the mucous membrane lining the air passages; the eyes are red and watery; there is defluxion from the nostrils, hoarseness, and cough. The eruption commonly appears on the fourth day, at first about the head and neck, then the trunk and arms, and finally reaching the lower extremities; it takes two or three days to complete its course, and when it reaches the feet and legs has often begun to disappear from the face. The eruption consists of little papules, somewhat resembling flea bites, of a dark red color, which as they coalesce at their edges assume an irregularly crescentic form. The period of incubation, that is, the time elapsing from exposure to the contagion to the time of attack, is put down as from seven to fourteen days. All ages are liable to it, though infants at the breast are not so apt to be attacked as those somewhat older. It often shows itself in newly recruited regiments, spreading from one individual to another so rapidly as to assume the form of an epidemic. The disease is not commonly dangerous, though when introduced into the Pacific islands, some years since, it proved exceedingly fatal. When the eruption is fully out, the cough, at first dry and troublesome, generally becomes softer and less frequent; and at the end of six or seven days from the coming out of the first papules they have disappeared. Where danger occurs, it is from inflammation of the air passages; the disease may thus become complicated with croup, or in subjects

predisposed to consumption the seeds of that disease may be developed. The eyes, too, are sometimes left irritable and inflamed. In all ordinary cases, a simple diet, the maintenance of an equable temperature, and perhaps the exhibition of a mild diaphoretic or expectorant, are all that is required.—For an account of measles in swine, see ENTOZOA.

MEASURES. See WEIGHTS AND MEASURES.

MEATH, an E. maritime county of Ireland, in the province of Leinster, bordering on the counties Cavan, Monaghan, Louth, Dublin, Kildare, King's, and Westmeath, and the Irish sea; area, 903 sq. m.; pop. in 1871, 94,480. It has only about 8 m. of coast, and no harbor of importance. The surface is generally level, the soil fertile, and the climate healthful. Oats are the principal crop, but only about one third of the land is under cultivation, the rest being devoted to grazing. The chief rivers are the Boyne and Blackwater. Coarse linens, cottons, frieze, paper, &c., are manufactured. The Midland Great Western railway and the Dublin and Belfast Junction railway pass through the county. The principal towns are Kells, the capital, Navan, and Trim.

MEAUX, a town of France, in the department of Seine-et-Marne, 25 m. E. N. E. of Paris; pop. in 1866, 11,343. It is on the Marne, near the canal of Ourcq. Meaux is an episcopal town, and was the see of Bossuet, whose remains repose in the cathedral, and relics of whom are preserved in the episcopal palace. The cathedral

dates from the 12th century, but is still unfinished. There is a communal college with a library of 15,000 volumes, and the town has a brisk trade in grain and cheese.

MECCA, the chief of the three holy cities of the Mohammedans, capital of the province of Hedjaz, Arabia, 65 m. E. of Jiddah, its port on the Red sea, and 250 m. S. of Medina, in lat. 21° 30' N. and lon. 40° 15' E.; pop. about 45,000. It lies in a narrow valley shut in by bare hills, from 200 to 500 ft. high. Its length from N. to S. is about 2½ m., its breadth is somewhat less than a mile, and it is defended by a fortress on an elevation S. of the city. The houses are well built of brick and stone, and, unlike those of most oriental towns, have windows opening to the street; they generally contain apartments which are let as lodgings to the pilgrims who annually visit the holy city. The streets are broad and unpaved. The only

public building worthy of note is the shrine or temple called *Beit Allah*, "House of Allah," or more commonly *Caaba*, "Square House." This great sanctuary, the most famous and holy in the Mohammedan world, stands in the centre of an oblong square, enclosed by a wall 250 paces long and 200 broad, none of the sides of which run in a straight line, though at first sight the whole appears to be of regular shape. Inside of the wall is a colonnade consisting of a quadruple row of pillars on the eastern side and of a triple row on the other sides. These pillars are more than 20 ft. high, and generally about 18 in. in diameter. Some are of white marble, granite, or porphyry, but the greater number are of common stone from the neighboring hills. Their number is variously stated; Burton counted 554. They are united by pointed arches, every four of which support a small dome plastered and whitened on the outside; these domes are 152 in number. Parts of the walls and arches are gaudily painted in



The Great Mosque, Mecca.

stripes of yellow, red, and blue. The floors of the colonnades are paved with large stones badly cemented together. The Caaba is 115 paces from the northern colonnade and 88 from the southern. It is an oblong massive structure, 18 paces long, 14 broad, and from 35 to 40 ft. high, and is built of fine gray granite in horizontal courses of masonry of irregular depth; the stones are well fitted together with excellent mortar like Roman cement. It was entirely rebuilt as it now stands in 1627, a torrent in the preceding year having thrown down three of its sides. The roof of the Caaba being flat, it has at a distance the appearance of a perfect cube. At the S. E. corner of the Caaba is the famous "black stone," which is believed to have been brought from heaven by angels. It forms a part of the angle of the building, 4 ft. 9 in. from the ground, and is an irregular oval about 7 in. in diameter, with an

undulating surface composed of about a dozen smaller stones of different sizes and shapes well joined together with a small quantity of cement, and perfectly smoothed. It is said to have been broken in pieces by order of a heretical sultan in 1022, but was cemented together and bound with a silver ring. The color is black and metallic, and the stone is worn smooth by the lips of worshippers. Burekhardt thought it looked like a mass of lava containing several small extraneous particles of a whitish and of a yellowish substance; while Burton says it appeared to him like a common *aërolite*. The pilgrims who walk around the Caaba begin their procession at the black stone, which is touched and kissed with the highest veneration. A pavement of granite, polished like glass by the feet of the faithful, surrounds the Caaba. Outside of this pavement, which forms an irregular oval, is a line of iron posts supporting cross rods from which hang white or green glass globe lamps. The interior of the Caaba is plain, and there are no windows or any other opening except the entrance and a small door leading to a staircase to the roof. The floor and walls are covered with marble of various colors, but mostly white; and the roof and upper part of the walls are covered with red damask embroidered with gold. The interior is lighted by many lamps, but there is no other furniture except a small press in one corner in which the key of the building is sometimes placed. Near the door, outside, is a small hollow, where Abraham and Ishmael are said to have mixed the cement for building the Caaba. On the N. W. side are the supposed graves of Ishmael and Hagar, enclosed by a semicircular wall covered with white marble. Opposite the E. corner is the *zem-zem* or sacred well, believed to be that of Hagar. Its water is unpleasant in taste, and has a cathartic effect; the Mohammedans ascribe to it great and peculiar virtues. None but Mohammedans are admitted to the Caaba or its enclosure, but a few travellers from Christendom have ventured to enter in disguise at the risk of their lives. It was thus visited by Burekhardt in 1814, by Burton in 1852, and by Maltzan in 1862. Arafat hill, 12 m. E. of Mecca, is visited by all pilgrims, who must perform there certain devotions and listen to an annual sermon before they can justly claim to have performed the pilgrimage. It is about 200 ft. high, and rises from a gravelly plain on which the pilgrims pitch their tents. (See ARAFAT.)—The trade of Mecca is chiefly derived from the pilgrims, who come from all parts of the Mohammedan world, and generally bring merchandise with them. The people are lively and polished in their manners, and have a remarkable knowledge of languages. There are a few artisans, and some small potteries and dye works. The climate of Mecca is sultry and unwholesome, especially in August, September, and October. It was the birth-place of Mohammed. It is ruled by a sheriff,

who at present is nominally dependent on the Turkish sultan. The Wahabees took possession of Mecca in 1803 and held it till 1818, when they were expelled by the forces of Mehemet Ali, pasha of Egypt. The number of pilgrims to Mecca in 1873 was larger than for many previous years, and was estimated at 200,000. Of these, more than one half came by caravans; about 46,000 arrived by way of Jiddah and other ports on the Red sea, and for their transportation 12 ships, 87 steamboats, and a large number of small vessels were employed. Nearly 15,000 Malays and Hindoos came from India, embarking at Calcutta and Bombay. Turks, Egyptians, Mogrebins, and Caucasians, to the number of 20,000, came by way of the Suez canal; and there were 3,000 pilgrims from ports in the Persian gulf.

MÉCHAIN, Pierre François André, a French mathematician and astronomer, born in Laon, Aug. 16, 1744, died in Castellon, Spain, Sept. 20, 1805. After receiving a limited education, he became a mathematical tutor, devoting his leisure hours to the study of astronomy. Trying to sell his telescope in order to assist his father, he attracted the notice of the astronomer Lalande, who procured him a situation as hydrographer under the government. In this capacity he assisted M. Bretonnière in surveying the French coast between Nieuport and St. Malo; but his attention was chiefly directed to the theory of eclipses and comets, 11 of the latter having been discovered and the orbits of 24 computed by him. In 1782 the academy of sciences admitted him to membership and awarded a prize to his "Memoir on Comets." Under the republic he was employed, together with Delambre, to measure the arc of the meridian comprised between Dunkirk and Barcelona. On returning to Paris, he refused to deliver his papers to the academy, because he had detected a difference of 8" in his calculations respecting the latitude of Barcelona. After being appointed director of the observatory of Paris, he solicited the board of longitude to permit him to prolong the measurement of the arc from Barcelona to the Balearic islands, that he might have an opportunity of correcting his error. The board consented, and Méchain set out for Spain to conduct the operation, but fell a victim to an epidemic disorder on the way. The most important of his scientific papers are to be found in the *Mémoires des savants étrangers*, in the *Transactions of the French academy*, and in the *Connaissance des Temps* from 1786 to 1794, of which he was for some time editor.

MECHANICS, that branch of natural philosophy which treats of the action of forces on bodies. It is divided into statics, which treats of the action of forces in equilibrium, and dynamics, which treats of the action of forces on bodies in motion. Newton divided it into practical and rational mechanics, the former relating to the mechanical powers, and the latter to the theory of motion. In a restricted sense

the word mechanics signifies the inventing of machines (Gr. *μηχανάσαι*, to invent or construct), or at most consideration of the action of forces upon them, and this is the sense in which the ancients used it; but the science has long since passed beyond such limits, and comprehends the laws by which the motions of the heavenly bodies are governed, as well as those which affect their form, and also the action of gravitation upon bodies on the earth. Hydrostatics, hydrodynamics, and even sometimes pneumatics, are considered branches of the general science of mechanics. (See HYDROMECHANICS, and PNEUMATICS.)—The invention of simple machines for moving large masses of bodies is older than history. The lever and inclined plane were probably the first simple powers used, the construction of the latter being naturally suggested by the advantages offered by the natural slopes of hills. It is generally believed that the vast blocks of stone which are found in elevated positions in ancient Egyptian structures were raised to their places by inclined planes formed of earth on the exterior of the walls and afterward removed. The successive steps in the invention of machines have not been recorded, the work of Vitruvius on architecture, written under Augustus, being the principal source of information of those which were in use at and before his time. From his descriptions there were then in use the lever, the wheel and axle, the simple and compound pulley, and a forcing pump for supplying the public fountains, whose invention he ascribes to Ctesibius of Alexandria, who flourished in the latter half of the 3d century B. C. Among other machines this mechanician also invented the clepsydra or water clock. (See CLEPSYDRA.) Vitruvius also describes a complex machine in which wheels acted upon each other by means of cogs, and which was used for measuring distances travelled by carriages or ships; and he describes at considerable length military engines for throwing masses of stone. Water wheels were used for grinding corn, and water was raised by buckets which were moved by wheels, the power being supplied by men walking on them. It is probable that most of the engines described by him were in use by the Greeks before the erection of the Parthenon. There is no positive evidence of the employment of the expansive force of steam as a moving power before the latter part of the 17th century, and then it was only used to raise water; and its general application to machinery dates only from the year 1768. Among the ancients, Archimedes seems to stand almost or quite alone in the power of conceiving in any great degree true theoretical ideas of mechanics. He explained the theory of the lever and some important properties of the centre of gravity, and also the fundamental doctrines of hydrostatics, particularly the equilibrium of floating bodies. The idea that the particles of a fluid have the power to communicate force with-

out loss, in consequence of being perfectly free to move among one another, seems never to have been clearly comprehended before his time. Archimedes was so far ahead of his age that it was only within a comparatively recent period (the epoch of Galileo) that his doctrines became established. Before Archimedes the doctrines of Aristotle had been generally adopted in physics, and for many centuries afterward were accepted by the scientific world. Aristotle taught that all motion was naturally circular, an idea which lasted till the first law of motion was established. He divided motion into natural and violent, and accounted for the fact that a body thrown in a horizontal direction diminishes in velocity, while a falling body increases, by saying that the former is a violent and the latter a natural motion. In accounting for the continuance in motion of a stone thrown by the hand, he asks: "If the hand was the cause of the motion, how could the stone move at all when left to itself? If not, why does it ever stop?" He answers by saying: "There is a motion communicated to the air, the successive parts of which urge the stone onward, and each part of this medium continues to act for some while after it has been acted upon; and the motion ceases when it comes to a particle which cannot act after it has ceased to be acted on." He attempted the discussion of the properties of some of the simple machines, and propounded some theories in regard to the lever, but even these have more the nature of mere suggestions. He asks why small forces may move great weights by means of a lever, and answers by asking if it is because the greater radius moves the faster; and he also queries whether a wedge affords power because it is composed of two opposite levers. As to the reason why a person when rising from a chair bends his legs and body to acute angles with his thigh, he suggests that it is because the right angle is connected with equality and rest. Here he again departs from the more philosophical method he had pursued with the arms of the lever, and returns to his usual metaphysical ones; and this is the tendency of most of the mechanical ideas of the ancients, with the exception, as has been observed, of those of Archimedes, which were unappreciated by his contemporaries. The latter, in his investigations concerning the properties of the lever, commences with the axiom that two equal weights balance each other on a lever of equal arms, and proceeds by employing the mathematical methods then in use to show that equilibrium always will exist in a lever when the bodies supported by it are inversely proportional to their distances from the fulcrum. Proceeding in his reasoning, he also concludes that there must be in every body a centre of force corresponding to the fulcrum in the lever. The principles which were so long ago clearly conceived by him were however not only undeveloped, but were not un-

derstood, and were therefore neglected for many centuries, till they were revived by Galileo and by Stevinus.—The mechanical advantage of the inclined plane was one of the first and most important propositions which engaged the attention of mechanicians on the revival of physical science. Cardan in 1545 asserted that the force necessary to support a body on an inclined plane is double when the inclination is double. Guido Ubaldo in 1577 attempted to prove that an acute wedge will produce a greater mechanical effect than an obtuse one, but did not establish the proposition. His references to the screw, the inclined plane, and the wedge, however, show that he comprehended their relations. Michael Varro, whose *Tractatus de Motu* was published at Geneva in 1584, treats of the wedge in a manner which indicates at least an approach to the doctrine of the composition and resolution of forces. The explanation of the true theory of the inclined plane was first made by Stevinus of Bruges. He supposed a loop of a string, loaded with 14 equal balls at equal distances, to hang over a double inclined plane whose sides were in the proportion of two to one, and which would therefore support four and two balls respectively. That the loop must remain at rest followed from the fact that after any motion it would still be in the same condition as before, so that if motion took place it would go on indefinitely and result in perpetual motion, which he regarded as an absurdity. He shows that the festoon of eight balls hanging below the planes may be removed without disturbing the equilibrium of those resting upon the planes; so that the four balls on the longer plane would balance the two on the shorter, which would make the weights supported by the planes proportional to their length. Stevinus also shows that when three forces act upon a point, they will be in equilibrium when they are in proportion to the sides of a triangle which are parallel to the direction of the forces. He however only gives a demonstration of the case in which two of the forces are at right angles to each other. Leonardo da Vinci had before this obtained clear ideas regarding the equilibrium of oblique forces, as shown by extracts from his manuscripts published by Venturi in 1797. In 1499 Leonardo gave a correct statement of the forces exerted in an oblique direction on a lever, and made a distinction between the length of the arm of the lever and that of the perpendicular to the direction of the force. These views of Leonardo are believed to have been sufficiently known by Galileo to aid him in his speculations, and the modes of reasoning of the two are somewhat similar. Leonardo had also asserted that the time of descent of a body down an inclined plane is to the time of its vertical descent in the proportion of the length of the plane to its height. The most important discoveries of Galileo are in regard to the laws of falling

bodies, as determined by his observations on the vibrations of a pendulum, which he found were proportional to the square roots of the lengths of the pendulum. He was also the first to enter into a mathematical investigation of the strength of materials in resisting strains. The problems regarding the collision of bodies were attempted by Descartes, who made some important observations; but no clear ideas or theories were obtained till Huygens in Holland and Wallis and Wren in England turned their attention to the subject, all these about the same time sending papers to the royal society of London. The first example of a correct solution of a problem of circular motion occurs in the theorems of Huygens. The problem of the centre of oscillation was proposed by Mersenne in 1646, and had attracted the attention of Huygens when a youth, but he was then unable to find any principles sufficient for its solution. But when, in 1673, he published his *Horologium Oscillatorium*, a fourth part of the work was on this subject, and the theories then advanced have been found strictly correct. In 1687 Newton's great work was published, when for the first time the science of mechanics was extended from a consideration of the action of forces upon bodies on the earth to the action of forces exerted between celestial bodies, and the adoption of the theory of universal gravitation. It was enriched about the same time by the method of fluxions of Newton, and its improvement by Leibnitz, known as the differential calculus, an invention which greatly facilitated the investigations of mechanical problems. The illustrious family of Bernoullis of Basel, all of whom were natural philosophers, added much to the mathematical knowledge of mechanics. The transcendent mathematical powers of Euler gave analytical method to mechanical solutions. His memoirs occupy a large portion of the "Petersburg Transactions" from 1728 to 1783, and so many were left at his death that their publication was not completed in 1818. In 1747 D'Alembert and Clairaut sent on the same day to the French academy of sciences their solutions of the celebrated "problem of three bodies" (see Moon), which for a long time claimed the attention of mathematicians. The labors of Clairaut have been of great service to the science of mechanics, but his name, and those of D'Alembert, Lagrange, and Laplace, belong more to the department of physical astronomy, and with others have received attention in the article ASTRONOMY.—The subjects of friction, strength of materials, theory of arches and domes, perpetual motion, and hydromechanics, will be found under those heads. Universal gravitation is treated in the articles ASTRONOMY, GRAVITY, MOON, and under other astronomical titles, and the science of projectiles under GUNNERY. This article will be occupied only with a consideration of the following subjects: 1, the laws of motion, including the laws of impact and uniformly

accelerated rectilinear motion; 2, the composition and resolution of forces; 3, centrifugal force; 4, the pendulum; 5, the mechanical powers, or the theory of machines. Statical and dynamical principles will be treated in conjunction, as the subjects generally embrace both. I. THE LAWS OF MOTION. These laws were pretty well recognized if not established before the *Principia* of Newton was written. Galileo, Kepler, Descartes, Wren, Halley, Hooke, and Huygens had successively advanced toward a comprehension of them, the two works of the last named, on the impact of bodies and on centrifugal force, containing assumptions, if not direct statements, of what are known as the three laws of motion. The mission of Newton was more to generalize these laws and apply them to the solution of the motion of the heavenly bodies. His *Principia* commences with a statement of the laws of motion, and it is in the form there given that they are generally known. They are as follows: *Law 1.* Every body continues in a state of rest or of uniform motion in a straight line unless acted on by some external force. This law results from the property of inertia, by which matter cannot give itself or deprive itself of motion. *Law 2.* Change of motion is proportional to the force impressed, and is in the direction of the line in which that force acts. *Law 3.* To every action there is always opposed an equal reaction. Force may be defined as any cause by which a body is moved, or held in any position, or has its motion changed. It may be the expansive force of steam and gases, animal power, the attraction of gravitation, or electricity. Inertia is that property of matter which offers resistance to any force tending to change its state of rest or of motion, and it is an element of the greatest importance in mechanics, requiring consideration in every calculation where change of motion takes place. A body occupying a fixed place in space would be in a state of absolute rest; but ordinarily a body is said to be at rest when it is stationary with regard to surrounding bodies. A body is in absolute motion when moving from one point to another in space, and in relative motion when it is regarded as moving with respect to some other body. The velocity of a moving body is the distance it travels in a given time, the units of space and time being the foot and the second. Velocity may be uniform or variable. It is uniform when the body moves through equal spaces in equal times. Variable motion may be regular or irregular, and it may be accelerated or retarded. When it is accelerated in a constant ratio, it is said to be uniformly accelerated; and when in like manner retarded, it is said to be uniformly retarded.—*Momentum and Impact.* The force of matter in motion is called its momentum, and sometimes quantity of motion, and is equal to the mass or quantity of matter multiplied into its velocity; thus $m=q \times v$, the

unit of mass being generally considered the pound avoirdupois. A cannon ball weighing 100 lbs. and moving with a velocity of 1,200 ft. per second would have a momentum of 120,000 lbs. or 60 tons. When two bodies have equal momenta, their velocities will be in the inverse ratio to their quantities of matter; that is, if $q \times v = q' \times v'$, then $v : v' :: q' : q$. A force is impulsive when it acts for a moment only, like the stroke of a hammer. When such a force alone acts against a movable body, it necessarily causes uniform motion, a fact which may be shown experimentally by using Atwood's machine, as will be seen further on. When bodies meet by impact, the motion which results depends upon their degree of elasticity and upon their relative momenta. Bodies are elastic when they have the power of restoring their form after compression or expansion. There are no solids which are perfectly elastic, although glass and steel are nearly so within certain limits. Permanent gases are perfectly elastic, having the property of expanding after compression to their original bulk, and of being unchanged in their power of resisting pressure. (See ELASTICITY.) Vapors are also perfectly elastic for all pressures at which the liquids from which they are derived are above their boiling points. (See BOILING POINT.) Bodies are inelastic when they have no power of restitution after compression.

Putty is almost perfectly inelastic. If an inelastic body, m , fig. 1, is moving in the direction $m c$, and it encounters another inelastic body, m' , which is at rest, the two bodies will after impact move together with a common velocity equal to half that which the body m had before impact, this having imparted half its momentum to m' ; therefore the momentum of the two bodies after impact must be equal to that of m before impact. If v represents the velocity of the body m before, and v' its velocity after impact, then $mv = (m+m')v'$,

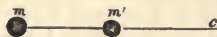


FIG. 1.

and $v' = \frac{mv}{m+m'}$. When two inelastic bodies, moving in the same direction with unequal velocities, collide, they will move together with a common velocity, and with a momentum equal to the sum of their momenta previous to impact; or $mv + m'v' = (m+m')v''$, or $v'' = \frac{mv + m'v'}{m+m'}$. If two bodies, m and m' , fig.

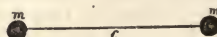


FIG. 2.

2, moving toward each other, collide, they will come to rest if their momenta are equal; but if their momenta are unequal, they will after collision move together with a common velocity in the direction of the body having the lesser momentum, and with a momentum equal to the difference of momenta before impact; or $mv - m'v' = (m+m')v''$, and

$v'' = \frac{mv - m'v'}{m + m'}$.—The following are among the

propositions of Huygens on elastic bodies. If a body meets an equal body at rest, after impact the former will be at rest, but the latter will acquire the velocity of the impelling body. If two equal bodies moving with unequal velocities strike one another, they will after impact move with interchanged velocities. Any body, however large, is moved by any body, however small, and moving with any velocity whatsoever. If two bodies meet from opposite directions whose velocities are inversely in proportion to their quantity, each will rebound with the velocity with which it approached. These propositions may be experimentally verified by the apparatus shown in fig. 3. Let two elastic balls be suspended at equal heights

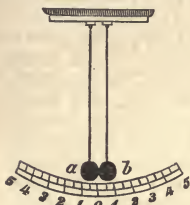


FIG. 3.

by slender threads of a radius corresponding to the graduated arc ab . If one of the balls is raised and allowed to fall against the other, this will be impelled to a corresponding height; if both are raised to the same height and let fall, they will rebound to their original heights (theoretically);

and if one is let fall from a greater height than the other, they will rebound with reciprocal velocities. If several balls are hung between them so that they touch each other, and impact is made by a terminal ball, all the intermediate balls will remain at rest, the impulse being transmitted through them to the opposite ball. If a perfectly elastic ball is thrown obliquely against a smooth plane, it will be reflected so as to make the angle of reflection equal to the angle of incidence. If the ball is imperfectly elastic, the angle of reflection will be greater than the angle of incidence; and if the ball is perfectly inelastic, it will not be reflected, but will slide upon the plane.—*Uniformly accelerated Rectilinear Motion; Laws of Falling Bodies.* As a consequence of the property of inertia, when a body has been put in motion and all force is removed, it tends to continue in motion with uniform velocity and in a right line. But if the force which caused the motion is uniform and constant, the body will receive equal increments of force during equal spaces of time, and therefore its motion will become uniformly accelerated. The most uniform constant known force at the surface of the earth is gravitation, and it is by its means that the laws of uniformly accelerated motion are studied. A body falling through the air does not in fact have its motion uniformly accelerated, because of the resistance of the air; but it can be proved by experiment as well as by a process of reasoning that such would be its motion in a vacuum. That all bodies near the surface

of the earth tend to fall with equal velocities without regard to their density or bulk, is shown by the common guinea and feather experiment in a tube exhausted of air. The element of resistance of the air will not therefore, in considering the subject, be taken into account. The velocity of a falling body, in consequence of gravity being a uniform and constant force, will be in proportion to its time of fall, and its average velocity during any given space of time will be at the middle of that space; and therefore the velocity which a body in falling acquires at the end of any period of time will be double the average velocity from the commencement. Let the figures 1, 2, 3, 4, 5, 6 on the left of the column in the adjoining diagram represent the number of seconds during which a body falls from rest; they will also represent the velocities acquired at the ends of the seconds. Now, as the average velocity during the first two seconds is acquired at the end of the first second, and as the average velocity of the next two seconds is acquired at the end of the third second, if we represent the space fallen through during the first two seconds by S , the space fallen through during the third and fourth seconds will be represented by $3S$, and for similar

1	S
2	
3	$3S$
4	
5	$5S$
6	

reasons the space fallen through during the fifth and sixth seconds will be represented by $5S$. Therefore, during equal successive portions of time a body falls from rest through successive spaces represented by the odd numbers 1, 3, 5, 7, &c.; so that if the space through which it falls in one second be called a unit, that through which it falls during the first two seconds will be $1+3=4$, and that through which it falls from rest in three seconds will be $1+3+5=9$ spaces; or the spaces through which a body falls from rest during 1, 2, 3, 4, &c., seconds will be proportional to the squares of these numbers. We thus by a process of reasoning, and without the assistance of experimental demonstration, arrive at the following laws of falling bodies: 1. The velocity acquired by a body in falling is proportional to the time of fall. 2. The spaces through which a body falls in equal successive periods of time vary as the odd numbers 1, 3, 5, &c. 3. The whole space through which a body falls from rest is proportional to the square of the time. 4. The velocity acquired by a falling body during any period of time, if continued uniformly, will carry it through twice the space in the same time; a law which follows from the second law, by which the spaces fallen through during equal successive periods of time increase by a constant quantity, which is twice the space through which a body falls from rest during one second. This constant quantity, which in this latitude is 32.16 ft., is usually

expressed by the letter g . The following table embraces the facts contained in these laws:

TABLE SHOWING LAWS OF FALLING BODIES.

TIME IN SECONDS.	Velocities acquired in values of g .	Spaces fallen through in values of $\frac{1}{2}g$.	Total height fallen through in values of $\frac{1}{2}g$.
1.....	$g = 32.16$ ft.	1 = 16.08 ft.	1 = 16.08 ft.
2.....	$2g = 64.32$ "	8 = 48.24 "	4 = 64.32 "
3.....	$3g = 96.48$ "	9 = 80.40 "	9 = 144.72 "
4.....	$4g = 128.64$ "	7 = 112.56 "	16 = 257.28 "
5.....	$5g = 160.80$ "	9 = 144.72 "	25 = 402.00 "
6.....	$6g = 192.96$ "	11 = 176.88 "	36 = 578.88 "

These laws may be experimentally verified with considerable accuracy, but in order to do so it is necessary to reduce the velocity of the falling body, because a body dense enough not to be much affected by the resistance of the air soon acquires so great a velocity that it cannot be estimated with accuracy; and if the body is light, it soon meets with so much resistance that the motion becomes uniform. The most ancient method for diminishing the velocity was with the inclined plane, by Galileo. By referring to that part of this article which treats of the inclined plane, it will be seen that the force with which a body tends to move down such a plane is to the force with which it would fall freely as the height of the plane is to its length. If its height is 1 ft. and its length 16 ft., it will move down the plane 1 ft. during the first second, 3 ft. during the second second, and so on; and therefore through

equal weights, a and b , are suspended over a friction wheel placed at the top of a graduated post 9 or 10 ft. high. A platform, p , having a joint by means of which it may be suddenly dropped at any desired moment by connection with clockwork, is placed just below the wheel. The weight a is placed upon this platform and loaded with a metallic bar, whose gravity is used as the accelerating force. At a chosen moment the platform falls and the weight begins to descend with accelerated velocity. A ring, c , placed at any desired distance below the platform, takes off the accelerating bar, after which the weight descends with uniform motion, only imperceptibly retarded by the air and an exceedingly small amount of friction. If the sum of the weights a and b is 99 ounces and the accelerating bar weighs one ounce, gravity acts practically on only one ounce, but it has to give motion to 100 ounces; therefore the velocity of descent will be $\frac{1}{100}$ as great as that of a weight falling freely; so that during the first second it will fall only 1.93 in., during the fourth second only 13.51 in., and during four seconds only 61.75 in. It will be observed that the velocity may be varied by changing the weight of the accelerating bar. By changing the position of the ring c from one point to another, the rate of acceleration may be determined, and the velocity of motion attained at any point of time or space fallen through may be ascertained by measuring the uniform motion of the weights after the removal of the accelerating bar. The principal advantage of this machine is the facility it affords for estimating the relations between the accelerating force and the space described in a given time. Atwood's machine has been modified by Bourbouze so as to act somewhat on the principle of Morin's apparatus next described. The weights are set in motion by means of temporary magnets, and upon a cylinder covered with smoked paper curves are traced by a vibrating style, which is also moved by a temporary magnet. Morin's apparatus is autographic, and in some respects, especially in its great accuracy and facility in verifying the law of acceleration, is preferable to Atwood's machine. Its essential parts are shown in fig. 5. A frame 8 or 10 ft. high holds the parts in position, which consist of a light wooden cylinder, M , about one third of the length of which is shown in the figure. It is turned by a weight, Q , suspended by a cord passing around a drum, G , which carries a cog wheel c that plays into the endless screw a . At first the motion is accelerated, but after a short time, on account of the resistance of the air encountered by the revolving fan which is turned by the endless screw d , uniform motion is attained. Then, by pulling a cord, K , a lever, A , displaces a catch, C , which liberates a weight, P , which then begins to fall with accelerated velocity between two vertical guiding wires. The weight is provided with a pencil, z , which describes a line in descending upon



FIG. 4.

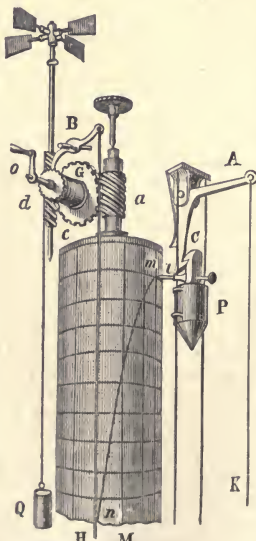


FIG. 5.

the 16 ft. during four seconds. But the results are not as accurate as with the employment of Atwood's machine, a simplified form of which, to facilitate explanation, is shown in fig. 4. Two

the revolving cylinder, which, being marked with equidistant vertical and transverse lines, indicates at a glance the direction of the curve. When the paper is flattened out, this curve is found to be parabolic, thus showing that the spaces through which the weight falls are in proportion to the squares of the times. The other laws may also be verified by Morin's apparatus; but such verification is unnecessary, for the other laws are natural consequences of the law of squares. The following formulas are of frequent use in mechanical calculations. If the number of seconds during which a body falls from rest is represented by t , and the space fallen through in one second by $\frac{1}{2}g$, the entire space fallen through will be expressed by the following equation: $s = \frac{1}{2}gt^2$ (1). Now, as the velocity acquired in falling during one second is g , and as velocity is proportional to time of fall, we derive the following equation: $v = gt$, and $v^2 = g^2t^2$ (2). Dividing this by

(1), we have $\frac{v^2}{s} = 2g$, whence $v = \sqrt{2gs}$ (3). Example: What velocity will a body acquire in falling 1,000 ft., and what time will it occupy in falling? Taking (3), $v = \sqrt{2gs} = \sqrt{64 \cdot 820} = 253.6$ ft. per second. Again, taking equation

(1), $s = \frac{1}{2}gt^2$, we derive $t = \sqrt{\frac{2s}{g}} = \sqrt{\frac{2000}{32 \cdot 16}} = 7.88$

seconds. A body does not fall in a perfectly vertical direction, because the point from which it falls, in consequence of its greater distance from the earth's centre, describes a greater circle than the point to which it falls. It will therefore strike a point somewhat to the east—about one fourth of an inch for a fall of 150 ft. The motion of an ascending body is retarded by the same law as that by which a descending body is accelerated.

II. COMPOSITION AND RESOLUTION OF FORCES. The union of two or more forces to produce a mechanical effect is called a composition of forces. Conversely, when a single force is replaced by two or more forces which produce the same effect, or when it is resolved into components for the purpose of mathematical analysis, such operation is called a resolution of forces. Analyses of cases must have regard to: 1, the quantity or intensity of the force or power; 2, the direction in which the force acts; and 3, the part of the body or load to which it is applied, and which is called the point of application. The quantity of force or power is usually expressed by assigning it a value in weight. It may also be represented by a straight line of proportionate length. Two or more forces acting in the same direction are equal to their sum; acting in opposite directions, they are equal to their difference. When two forces act together to produce a third, they may be represented by two sides of a triangle, while the resultant is represented by the third side. If a point is kept at rest by the action of three forces, these forces may be represented in quantity and direction by the sides of a tri-

angle. Thus, the point a , fig. 6, will be kept at rest when acted upon by three forces in the direction of the arrows b , c , and d , where the forces are represented respectively in quantity and direction by the sides b' , c' , and d' .

If the adjacent sides of a parallelogram represent two forces in quantity and direction, the resultant forces will always be represented by the diagonal contained between them. Thus, if ca and cd , fig. 7, represent two forces equal in quantity, having the direction shown by the arrows, their resultant will be represented by the longer diagonal cb ; but if ab and bd represent two forces acting in the direction of the arrows, the resultant will be represented

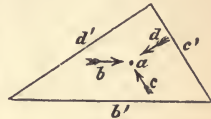


FIG. 6.

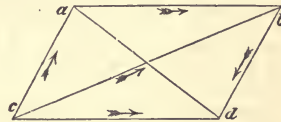


FIG. 7.

by the shorter diagonal ad . These propositions may be experimentally verified by the method of Gravesande. Let two weights of 8 and 10 lbs. be suspended over two friction pulleys by a string, as shown in fig. 8, and let a third weight of say 14 lbs. be suspended from this string, between the pulleys. After a time the system will come to rest.

If now the string supporting the middle weight be extended upward vertically to some point as d , and da and de be drawn parallel to the strings ab and bc , a parallelogram will be formed whose adjacent sides ab and bc , and whose diagonal bd will have the respective values 8, 10,

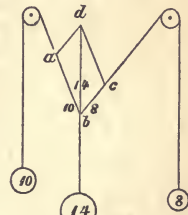


FIG. 8.

and 14. The point b is acted upon by three forces, represented by the respective sides of the triangle adb in quantity and direction, the weight 8 acting in the direction bc , the weight 10 acting in the direction ba , and the weight 14 acting in the direction db . The resultant of a number of forces acting upon the same point of a body may be determined by finding the resultant of the first two, and of this with the third, &c. This will be obvious by supposing four equal forces, ae , be , ce , and de , fig. 9, acting at right angles to each other upon the point e . The resultant of ae and be will be the diagonal fe of the parallelogram $aebe$; the resultant of fe and ce will be de ; and that of de and de will be

zero; which will also appear by observing that the forces ae and ce balance each other, as also do the forces be and de . The resultant of any number of forces may also be found by connecting the lines representing the forces, as shown in fig. 10. Suppose the forces to be represented in quantity and direction by the lines ab , bc , cd , and

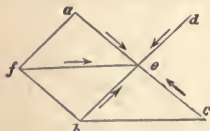


FIG. 9.

de . Connect the points a and e , and the line ae will represent the resultant of all the forces in quantity and direction; for ac is the resultant of ab and bc , ad that of ac and cd , and ae that of ad and de . The force which impels a sail vessel, moving with the wind off the quarter, is the resultant produced by the oblique action of the wind against the sails. Let ab , fig. 11, represent the position of the sail, and dc the direction and force of the wind. This force may be resolved into the components df and fc , the former parallel with and the latter perpendicular to the surface of the sail, and therefore the only force which is effective. But it is not acting in the direction of the keel, mk ; therefore it must be resolved into the components fg and gc , the latter of which will represent in quantity and direction the effective propelling force given by

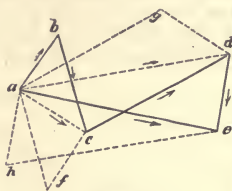


FIG. 10.

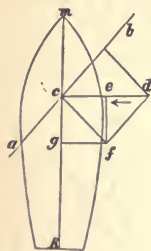


FIG. 11.

the wind, whose force is measured by dc .—**Centre of Gravity.** The point through which the resultant of all the forces caused by attraction of gravitation of the molecules of a body passes is called the centre of gravity. This point may be within the body, or, in consequence of its form, may be beyond it. The finding of the centre of gravity is a geometrical problem, but with an irregular-shaped body it can most easily be determined experimentally by suspending it in two positions, and finding the point of intersection of the two vertical lines which pass through the two points of suspension. This point of intersection will necessarily be the centre of gravity, for it is evident that it must reside in each of the two verticals, as each vertical is the resultant of all the gravitating forces of the body while suspended in any one position. In the case of bodies of uniform density and of geometrical

form, the centre of gravity is readily determined by geometrical principles. In a circle or sphere it coincides with the geometrical centre. In a plane triangle it is at the point of intersection of two lines joining the vertices of two angles with the middle of the opposite sides, as shown in fig. 12. In a cone or pyramid it is in the line joining the vertex with the centre of gravity of the base, and at one fourth the distance from the base. A body is said to be in equilibrium when the centre of gravity and the point of support are in the same vertical line. When the point of support is above the centre of gravity, the equilibrium is said to be stable. Founded upon this is the sometimes so-called paradox of maintaining a beam in a horizontal position with only one end resting upon a support, as shown in fig. 13. The condition is easily understood if the beam b

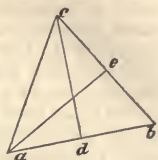


FIG. 12.

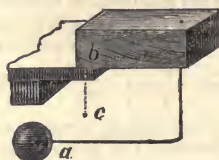


FIG. 13.

and the leaden ball a , with the attached bent rod, are considered as forming one body whose centre of gravity is at c . When this is vertically below the point of support the system will be in stable equilibrium. When a body has its centre of gravity above the point of support, but in the same vertical, it is said to be in unstable equilibrium. A distinction must be made between a state of stable equilibrium and a merely stable condition; for equilibrium implies a balance of force. A block, for example, may rest in a stable condition when lying upon the floor, although supported below its centre of gravity. But it cannot be said to be supported by a point; if it were, this point would need to be in a vertical with the centre of gravity. There are some cases of stable equilibrium when the centre of gravity is above the point of support. Thus when the body is an oblate spheroid, stable equilibrium will exist when it rests upon one of its poles a or b , fig. 14, because the centre of gravity occupies the lowest possible position. Disturbing the spheroid so as to bring the axis out of the perpendicular will raise the centre of gravity, and although it carries it to one side, as from c to c' , the point of support is removed still further in the same direction, as from b to d ; and therefore gravity will bring the body back till the

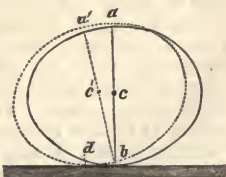


FIG. 14.

axis is vertical. When the point of support and the centre of gravity coincide, as in a wheel, the equilibrium is said to be indifferent, as is also the case when a sphere rests upon a horizontal plane, because the centre of gravity and point of support will always be in a vertical line. A prolate spheroid or an egg, lying on its side upon a plane, is in a state of stable equilibrium in one direction, and in that of indifferent equilibrium in another. Supported at the pole, the case becomes one of unstable equilibrium. The vertical line which passes through the centre of gravity is called the line of direction of the centre of gravity. A body will rest upon a horizontal plane only when the line of direction falls within the base on which it rests; and its degree of stability or power to resist change of position depends upon the horizontal distance of the line of direction from the edge of the base as compared with the height of the centre of gravity above the base, or upon the length of the arc which the centre of gravity will describe when the body is raised from a horizontal position of the base to that in which the line of direction falls through the edge of the base. Thus, if a horizontal plane is rotated on one edge till its centre of gravity falls in the line of direction, it will describe the quadrant of a circle, as shown in fig. 15;

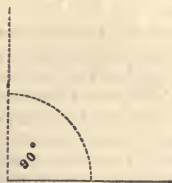


FIG. 15.

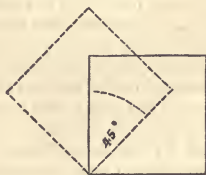


FIG. 16.

while the centre of gravity of a cube requires to be moved only through an arc of 45° in order to bring it vertically over one edge, as shown in fig. 16. III. CENTRIFUGAL FORCE. We will consider only the case of a body revolving in a horizontal circle, and exerting force only in the plane of the circle. Such a force is exerted when a ball is placed upon a horizontal rod, as shown in fig. 18, and rotary motion is produced by turning a vertical axis. Let

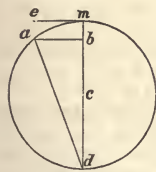


FIG. 17.

$d m$, fig. 17, represent the horizontal rod, and c the centre of motion, and suppose the body to be placed at m . The force exerted upon it by the revolution of the rod at each moment is perpendicular to the rod and in the direction of the tangent $m e$. To prevent its moving in that direction, therefore, some force must be exerted to restrain it. In this case the restraining force is the tension of the bar, the body being fastened to it. This

force is called centripetal, and it is manifestly precisely equal to the force with which the body tends to fly from the centre, or the centrifugal force. By its action the body is forced to move in the direction $m a$, and to arrive at a in the same time it would without restraint have arrived at e . The two forces that have produced this deflection from $m e$ to $m a$ are the force which is communicated by the rod, which may be represented by $a b = m e$, and the centripetal force, which may be represented by the line $m b$, and which is precisely equal to the force with which the body tends to fly from the centre, or the centrifugal force. It may be demonstrated that the centrifugal force of a body moving in a horizontal circle is equal to the product of its weight multiplied into the square of its velocity, divided by the product of the radius of the circle it describes, multiplied by $g = 32.16$, or the constant accelerating increment of a falling body. This may be expressed by the equation $c = \frac{w.v^2}{rg}$. Let n

represent the number of revolutions or parts of a revolution per second, and $2\pi r$ the circumference of the circle described by the body; then $2\pi.r.n$ will be its velocity. Hence

$$c = \frac{w(2\pi r n)^2}{rg} = \frac{4\pi^2}{g} . w . r . n^2 = 1.2275 \times w . r . n^2.$$

Therefore the centrifugal force of a body revolving in a horizontal circle is equal to its weight multiplied by the number of feet in the radius of the circle, and this product by the square of the number of revolutions or parts of a revolution per second, and this by 1.2275. Example: A ball weighing 10 lbs. is whirled in a horizontal circle on a radius of 5 ft., making 15 revolutions per second; what is its centrifugal force? $1.2275 \times 10 \times 5 \times 15^2 = 13,873$ lbs. (6.936 tons). In agreement with these principles are the first three of the celebrated propositions of Huygens appended to his *Horologium Oscillatorium*, which were then for the first time advanced: 1. If two equal bodies revolve in equal times in unequal circles, their centrifugal forces will be proportionate to the

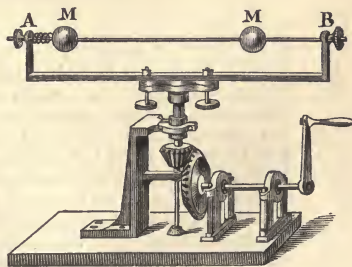


FIG. 18.

diameter of the circles. 2. If equal bodies revolve in equal circles with uniform but unequal velocities, their centrifugal forces will be proportional to their diameters. 3. If two

equal bodies traverse with equal velocity unequal circles, their centrifugal forces will be in the inverse ratio of the diameters. It follows from the first proposition that the centrifugal forces of any two bodies revolving around their common centre of gravity are equal. These propositions can be verified experimentally by employing the whirling table, fig. 18. A spiral spring which moves a registering index is fixed to one end of the horizontal rod. The adjustments may be so made as to cause a ball to revolve in any desired circle with any desired velocity. The applications of these principles are of daily occurrence. A horse or a carriage running in a circle exerts a centrifugal force requiring an inclination of the body toward the centre of the circle to counteract the tendency to be thrown over. The proper angle of inclination is found as follows: Suppose a horse to be running in a circle whose centre is *c*, fig. 19, and whose radius is *ac*. Draw the perpendicular *ab* to represent the weight of the horse, and let *bd*, parallel with *ac*, represent the centrifugal force; then *ad* will be the resultant, and the proper angle of inclination will be *dab*, whose tangent = $\frac{v^2}{rg}$. For

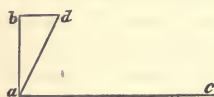


FIG. 19.

tangent $bda = \frac{bd}{da} = \frac{c}{w} = \frac{v^2}{rg}$. An inclination is imparted to railway carriages when traversing curves, by giving such an elevation to the rail on the outer curve of the track that the cross section of the latter shall be perpendicular to the required inclination or line of direction. Example: On a railway track 4 ft. 8 in. wide, how much elevation should be given to the outer rail on a curve of 600 ft.

radius for a velocity of 30 ft. per second? Taking the equation $\frac{c}{w} = \frac{v^2}{rg}$, the value becomes $\frac{900}{19820} = \frac{1}{21.47}$. Therefore the outer rail

must be raised $\frac{1}{21.47}$ of 56 in., or 2.6 in. When any body is rotated it has a tendency to revolve on its shortest axis, in consequence of the greater momentum in the particles furthest from the centre of motion. When a body having the form shown in fig. 20 is turned on its longer axis by means of a string suspended from *c*, if the body is perfectly regular and the geometrical axis perfectly coincides with



FIG. 20.

the axis of motion, it will not change its position; but as such coincidence never exists, the body will on being rotated begin to change its axis of rotation, and when sufficient speed is attained, the increased momentum resulting

from the change of position will cause the body to assume a position at right angles to its first position, and revolve about its shorter axis. The oblate spheroidal figure of the earth and other heavenly bodies is due to the action of centrifugal force. (See HYDROMECHANICS.) IV. THE PENDULUM. A simple pendulum may be defined as a body whose weight is confined to a point, and which, suspended from a fixed point, vibrates in an arc. A simple pendulum can only exist in theory. A single vibration of a pendulum is the distance through which it oscillates from the point at which it begins to descend on one side of the vertical, as at *a*, fig. 21, to the point on the opposite side of the vertical, as at *b*, where its motion is arrested by the action of gravity. Its passage from *a* to *b* and back to *a* is called a double vibration. All pendulums are compound because, having extension, their different particles are at different distances from the centre of motion, and therefore tend to vibrate in different times, because the time of vibration is increased by increasing the length of the pendulum. For small arcs the times of vibrations are the same; beyond certain limits increasing the arc increases the time. These facts were first ascertained by Galileo about 1585, when making use of the pendulum for counting time in astronomical observations. It has been demonstrated by mathematicians that if a pendulum vibrates in a small circular arc, the ratio of the time of one vibration to the time in which a body would fall half the length of the pendulum is equal to the ratio of the circumference of a circle to its diameter. Therefore, according to equation (1), substituting *l* for *s*, and letting *t* denote the time of one vibration, we have $t : \sqrt{\frac{l}{g}} :: \pi : 1$, or $t = \pi \sqrt{\frac{l}{g}}$.



FIG. 21.

From this equation it will be observed that the time of vibration of a pendulum varies as the square root of its length. Squaring both members of the equation, $t^2 = \frac{\pi^2 l}{g}$, or $l = \frac{t^2 g}{\pi^2}$. A half-seconds pendulum is therefore found as follows: $l = \frac{(\frac{1}{2})^2 \times 32.16 \text{ ft.}}{8.1415922} = \frac{96.48 \text{ in.}}{9.87} = 9.77 \text{ in.}$ A seconds pendulum is 39.1 in., and a two-seconds pendulum 156.4 in. When the arc of vibration is 1° on each side of the vertical, the daily retardation compared to the vibration in an arc which causes no retardation is $1\frac{1}{2}$ second. When the arc is 2° , the loss is $6\frac{1}{2}$ seconds; when 3° , it is 15 seconds; the formula for estimating the retardation being $\frac{1}{2}D^2$, where *D* represents the number of degrees the pendulum describes on each side of the vertical. The

inequalities in the times of vibration were obviated by Huygens by causing the pendulum to vibrate in a cycloidal arc, which he was the first to demonstrate is the curve of quickest descent from one point to another. To produce this cycloidal vibration, it is only necessary to cause the



FIG. 22.

the use of cycloidal arcs for pendulums are however greater than the advantage gained; therefore the pendulums of astronomical clocks are made to vibrate in small circular arcs. It has been said that in a compound pendulum there is a tendency in the different parts which are at different distances from the point of suspension to vibrate in different times. This

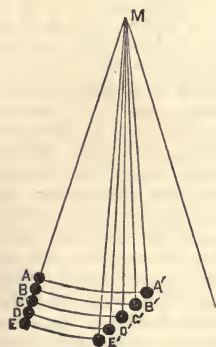


FIG. 23.

will have the positions A', B', &c. If they are all attached to the same wire and kept in the same line while vibrating, the balls moving in the smaller arcs will tend to accelerate the motion of those further from the centre of motion, and those vibrating in the larger arcs will tend to retard the motion of those nearer the centre of motion. Therefore there is a certain point where there is neither a tendency to retard nor to accelerate; this point is called the centre of oscillation of the system. The distance between this point and the point of suspension measures the length of a compound pendulum. If a homogeneous cylindrical bar is suspended at one end and made to vibrate, the centre of oscillation is two thirds the distance from the point of suspension. The discovery of the centre of oscillation, as we have seen, also marked an era in the science of mechanics, being one of its most important principles, and

having a wide application. The centre of oscillation and the point of suspension of a pendulum are convertible points; that is, if the centre of oscillation is made the point of suspension, the time of vibration will not be changed; a principle which allows of the experimental determination of the centre of oscillation, and therefore of the length of the pendulum. The centre of oscillation may be entirely beyond the pendulum, as in the metronome, an instrument used to measure time in music. (See METRONOME.) Its principle is shown in fig. 24, where a horizontal axis supports a rod, upon which there are two balls whose distance from the centre of motion may be varied at pleasure. If the balls are of equal weight and at equal distances from the centre of motion, they will not oscillate; but at unequal distances they will, and slowly in proportion as the difference of distance is small. The pendulum affords a correct means of finding the value of g , and therefore the height through which a body will fall from rest in one second of time. Taking the equation $l = \frac{v^2 g}{\pi^2}$ and trans-

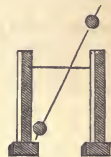


FIG. 24.

posing, we have $g = \frac{\pi^2 l}{t^2}$. Therefore, if the

length of the seconds pendulum is 39.1 in., the equation becomes in numbers $g = 3.14159^2 \times 39.1 = 32.16$ ft., which is twice the space through which a body will fall in one second of time.—The principal use of the pendulum is to measure time. To do this accurately, it is necessary to keep the point of suspension and the centre of oscillation at the same distance from each other, or in other words, to preserve a constant length. Increase of temperature causes a pendulum made of one piece to lengthen by expansion. If, however, two materials are so combined that while the expansion of one tends to lengthen the system, that of the other tends to raise the centre of oscillation, and the combination is such that the expansion of one shall exactly counteract that of the other, the desired end is attained. Such pendulums are called compensation pendulums. Two forms are shown in figs. 25 and 26. The bob of fig. 25 consists of a steel frame holding a hollow glass cylinder containing mercury. It is evident that if this mercury by its expansion causes the centre of

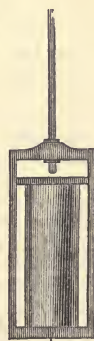


FIG. 25.



FIG. 26.

oscillation to rise just as much as the expansion of the rod causes it to descend, the length of the pendulum will remain unchanged. Now, as mercury expands about 14 times as much as steel, if the rod and frame are of steel, the column of mercury should be a little less than 6 in. for a seconds pendulum. Fig. 26 is the gridiron pendulum. It is made of brass and steel, whose rates of expansion are about 10 to 6. The bars are so arranged that the expansion of the brass shall exactly compensate that of the steel both in the gridiron and in the rod above it. The pendulum is used as a standard of measures of length. The length of a seconds pendulum at London was in 1824 declared by parliament to be 39.1393 in., and our government has adopted that standard. The French government in 1790 adopted as its standard the $\frac{10,000,000}{39,139,300}$ part of the quadrant of a great circle of the earth, which they called a *mètre*, equal to 39.37079 English inches. V. MECHANICAL POWERS.—*Theory of Machines.* A machine is an instrument or contrivance by which force may be transmitted from one point to another. The force employed in working a machine is called the power; the resistance which the body acted on offers to the force is called resistance, weight, or load, and is expressed in terms of weight whose unit is usually the pound avoirdupois; the point at which the power is applied is called the point of application; the line of direction of the force is the line in which the force is applied, and in which it tends to make the body move, although it usually moves in the direction of a resultant. That part of a machine which is immediately applied to the resistance is called its working point. The power, like the resistance, is expressed in units of pounds avoirdupois. It is usual, in explaining the theory of machines, to neglect many conditions for the purpose of perspicuity and convenience, which are afterward taken into account. Thus the parts of a machine are primarily supposed to have no weight, to move without friction, and to encounter no resistance from the air. After the theoretical effects have been calculated, these accidental effects receive attention. Machines are divided into simple and compound. The definition of a simple machine is not so obvious as is often thought. It is sometimes defined as consisting of one part; but as the pulley and wheel and axle are called simple machines, this definition is not exact, because each of these consists of several parts. If we conclude, however, that the only simple machines are the lever, the inclined plane, and the cord, this definition may be accepted; but simple machines, or, as they are often called, the simple mechanical powers, have generally been divided into six classes, viz.: 1, the lever; 2, the wheel and axle; 3, the pulley; 4, the inclined plane; 5, the wedge; 6, the screw.—1. *The Lever.* This power may be defined as an inflexible bar resting on a fixed point or edge, called the fulcrum

or prop. Levers are of three kinds, called the first, second, and third. The first kind is shown in fig. 27, where the fulcrum is between the power and the weight, and separates the two arms of the lever. These two arms are usually of unequal length, the weight having

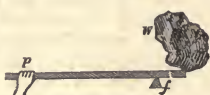


FIG. 27.



FIG. 28.

the same ratio to the long arm as the power has to the short arm. The second kind of lever, fig. 28, has the weight between the fulcrum and the power. The third kind, fig. 29, has the power between the weight and the fulcrum. In the first kind of lever it is evident that to produce equilibrium the power may be either less or greater than the weight, according as it is placed further



FIG. 29.

from or nearer to the fulcrum. The proportion of power to resistance, in any kind of lever, to produce equilibrium is reckoned in the inverse proportion of the distance of these forces from the fulcrum; the weight multiplied into the distance from the fulcrum being equal to the power multiplied into its distance from the same point. It cannot therefore be said that the second and third kinds of lever have two distinct arms. In the second kind, the weight, being always near the fulcrum, must always be greater than the power; in the third, the power, being always between the weight and the fulcrum, must always be greater than the weight. As the distances through which the power and weight move are in proportion to their respective distances from the fulcrum, it follows also that equilibrium is maintained when the product of their weights into the distances they respectively travel, or in other words, into their velocities, are equal, and furthermore that when a weight is moved by means of a lever, what is gained in power is lost in velocity. The common steelyard is an example of a lever of the first kind, nut crackers of the second, and fire tongs of the third. All these three kinds of lever are found in various parts of the mechanism of the human body and in that of many of the lower animals. An example of the first kind is seen in the movement of the occipital bone upon the atlas or upper bone of the spinal column. The raising of the body upon the toes by the action of the muscles of the calf of the leg, if the ankle joint is considered as a fulcrum, is an example of a lever of the second kind. The action of the biceps muscle upon the forearm, where the elbow joint is a fulcrum and the weight is held in the hand, is an example of a lever of the third kind. The power or the weight may act upon

the lever in an oblique direction; but in making calculations the perpendicular distance of the lines of direction from the fulcrum must be regarded instead of the actual distances on the

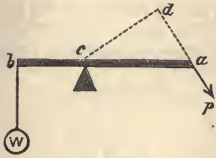


Fig. 80.

lever, as will be readily understood by observing fig. 30, where the power is applied in the direction dp , the long arm of the lever, ca , being practically reduced to the side cd of the right-angled triangle cda . When two or more levers, of one or more kinds, are combined, the system is called a compound lever. Platform weighing scales, such as are shown in fig. 31, are combinations of this kind, where the beam is a lever of the first kind, and eb , ab , and gf levers of the second kind, if we consider the weights on the beam km the power; but if we consider the load as a force acting on the

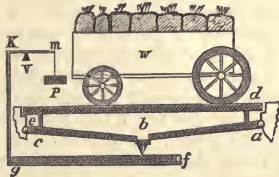


Fig. 81.

platform and raising the weights at p , then ab , cb , and fg become levers of the third kind.

—2. *The Wheel and Axle.* This power is a modification of the lever, and consists of a wheel and cylinder, or of two cylinders of unequal radii, revolving about a common axis, the larger cylinder being called the wheel and the smaller the axle. The wheel and axle may have the action of either kind of lever, but usually has that of the first, as shown in fig. 32, where the power is applied at a , the fulcrum is the axis c , while the weight is suspended from the short end of the lever, which is equal to the radius of the axle, the long end being equal to the radius of the wheel. If, however, the weight is suspended upon the same

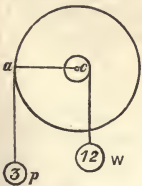


Fig. 82.

side with the power, and the latter is applied in an upward direction, as is often the case, the machine acts upon the principle of a lever of the second kind; and by applying the power to the axle the machine may be made to act as a lever of the third kind. Indeed, practically, levers are constantly changing in their action

from one kind into another; thus a shovel or hay fork held in the two hands may at one moment be a lever of the first kind and at the next one of the third kind, as the one or the

other hand becomes fixed or movable. In the simple wheel and axle the mechanical advantage is in proportion to the ratio of the radius of the wheel to that of the axle; if the former is 5 ft. while the latter is 5 in., the ratio of power to weight is as 1 to 12. This mode of increasing the efficiency of the machine is often inconvenient, and may be obviated by employing a differential axle, consisting of two parts of different diameters, as represented in fig. 33, the cord winding upon one part and off the other, and the weight being sup-

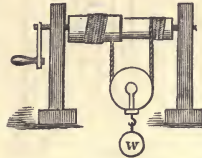


Fig. 83.

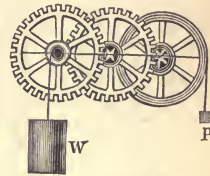


Fig. 84.

ported by a pulley. The most common plan in machinery is to employ a system of cog wheels, as shown in fig. 34. An equilibrium of forces will obtain where the product of the power multiplied into the radii of all the wheels is equal to that of the weight multiplied into the radii of all the pinions. Cog wheels are of three kinds, spur, crown, and bevelled. A spur wheel is shown at a , fig. 35, a crown wheel at b , and bevelled wheels at c . They are used to change the direction of force or axis of motion. The wheel and axle when applied to carriages serves a different purpose from that in ordinary machinery, and acts in a different way. The action of the carriage wheel when ascending an inclination is like that modification of the inclined plane called the toggle joint (fig. 44). When the road is a rigid and level plane,

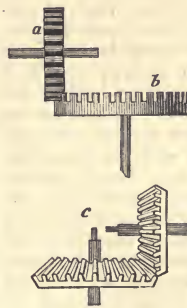


Fig. 85.

the wheel merely serves to afford successive supporting points to the load, the only resistance to be overcome being the sliding friction of the axle and the rolling friction between the wheel and the road. (See FRICTION).—3. *The Pulley.* The pulley is commonly said to act upon the principle of a lever of the first kind with equal arms, but this does not explain its principle. In fig. 36 we have indeed a lever of the first kind, with equal arms ac and cb ; and fig. 37 shows another such lever in the

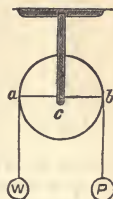


Fig. 86.

stationary pulley, and also a lever of the second kind in the movable pulley, where the power is applied at f , the weight suspended at b , while the fulcrum, which is changeable as the pulley ascends, is at a . This would seem to account for the mechan-

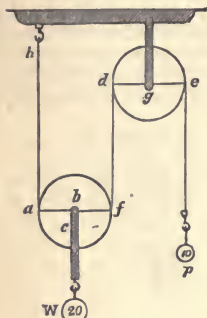


FIG. 87.

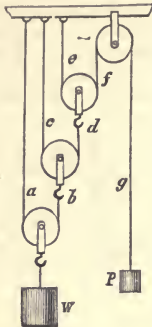


FIG. 88.

ical advantage, which is in the ratio of 2 to 1; but in place of the pulleys there may be substituted smooth cylinders which shall not revolve, and if they are well lubricated a similar mechanical advantage is obtained as when revolving pulleys are used. In this case there is evidently no use of a lever, so that it must be concluded that the mechanical advantage which is obtained is derived from the use of the cord. The system of pulleys shown in fig. 38 may include any number, the mechanical advantage being doubled with every additional movable pulley; for it is evident that the cord a sustains half of the weight W , and the cord c half of this, or one fourth of the whole; and further, that the cord e or f sustains one eighth of the whole. Several pulleys may be placed in one block. Instead of having one fixed pulley and the others movable, they may be placed in two frames or blocks, as shown in fig. 39, one block being fixed and the other movable. In this case one cord goes round all the pulleys, and therefore the weight is divided equally between the parts of the cord in the lower block, which parts are equal to twice the number of pulleys in the block. In this arrangement, where there are three pulleys in each block, the power will therefore be to the weight in the ratio



FIG. 89.

of 1 to 6. The pulley is a very portable and efficient power, the cord allowing great freedom in changing the direction in which the power is applied, by the employment of fixed single pulleys, which may be fastened to the ground, allowing of the application of horse or steam

power, or of any desired number of men. The rigging of ships is almost entirely managed by means of the pulley, and the hoisting of building material is to a great extent effected by the same machine.—4. *The Inclined Plane.* This power depends for its efficiency in the elevation of great weights upon the nearness with which the plane approaches to a horizontal surface.

The power required to produce the equilibrium of forces on an inclined plane may be determined in the following manner: We will suppose two cases, the first in which the power is applied in a direction parallel to the plane, and the second in which it is applied in a horizontal direction, or parallel to the base. Let m , fig. 40, be the centre of gravity of a freely moving body resting on a plane whose length is ab , and whose height is bc . Let the perpendicular me fall from the centre of gravity upon the plane; also draw md perpendicular to the plane. Let me represent the force of gravity, then will md represent the pressure perpendicular to the plane, and de or ml will represent the force in quantity and direction with which the body tends to move downward along the plane. An equal force acting in the opposite direction will therefore produce equilibrium. Since the triangle med is similar to abc , $ed : em :: bc : ab$. Consequently, when the power is applied in a direction parallel to the plane, equilibrium will exist where $p : w ::$ height of plane : length of plane, or $p : w :: \sin a : \text{rad}$. In the second case, where the power is applied in a direction parallel with the base, produce md to h , and draw eh parallel to the base; then will eh or mk of the parallelogram $me h k$ represent the force necessary to produce equilibrium, and mh will represent the pressure perpendicular to the plane. But in this case $eh : em :: bc : ac$. Therefore, power : weight :: height of plane : length of base of plane, or $p : w :: \sin a : \cos a$.

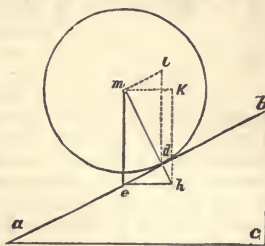


FIG. 40.

5. *The Wedge*, fig. 41, is a double inclined plane. It is used for forcing asunder bodies which offer great resistance, such as fibres of wood and the seams of rocks. It is usually propelled by percussion, which is applied to the head in the direction of its length, from a to b . The forces will be in equilibrium where the proportion of power to resistance is the same as that of thickness of



FIG. 41.

head to length of wedge. It is, however, difficult to estimate the power of percussion. To make the instrument effectual, considerable friction is required to prevent the resistance from forcing the wedge out of the crevice into which it has been driven.—6. *The Screw*. This machine is another form of the inclined plane. If a triangular piece of paper is wound around a cylinder, as shown in fig. 42, it will illustrate the formation and principle of action of the screw.

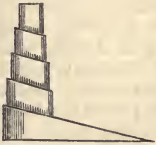


FIG. 42.

In passing once around the cylinder, the height between two adjacent layers of the edge which forms the hypotenuse will represent the height of a plane which has the circumference of the cylinder for its base. The power is applied by means of a lever, and in a direction at right angles to the axis of the screw, or in a direction parallel with the base of the plane. Therefore the forces are in equilibrium where the proportion of power to resistance equals that of the distance between the threads to the circumference of a circle described by the revolution of that point in the lever to which the power is applied. The distance between the threads is measured in the direction of the axis of the cylinder. The power of the screw is increased by increasing the length of the lever by which it is turned, or by diminishing the distance between the threads. It may also be increased by letting a screw with comparatively fine threads pass within another having coarser threads, thus causing the height of the plane to be practically diminished to the difference in distance between the threads. This form is called Hunter's differential screw. An endless screw is often combined with spur or crown wheels in the manner shown in fig. 43. It is often employed to measure minute spaces,

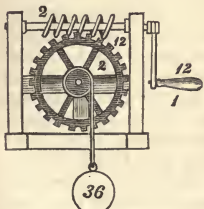


FIG. 43.

as in the dividing engine for graduating mathematical instruments. (See GRADUATION.)—*Toggle Joint*. The toggle joint, or elbow joint, which is used in various kinds of presses, consists of two radii or arms joined together by a hinge, as shown in fig. 44. The power

may be applied at the hinge or joint a , usually in the direction am , forcing the ends b and c further apart, and with great power as the arms approach a right line. It may also be applied at b and c , drawing the ends together, and forcing the point a outward in a transverse direction; a form used in hay and cotton presses. That this machine acts upon the principle of the inclined plane may be demonstrated as follows: Consider the end b of the

radius ab to be stationary. The power being applied in the direction am , the point a will describe the arc of a circle ad . A tangent to this arc, at any point in which the joint a may be moving, will represent the inclination, and mn the height of the plane by which the equilibrium of forces is determined. If the radius ab is inclined at an angle of 45° , then the inclination of the plane will be 45° ; so that if we consider it to have extension, its base will be equal to its height, and the power being applied in a horizontal direction it will produce equilibrium when it is opposed to a force having the effect of an equivalent weight suspended vertically from a . As the point a approaches d the tangent will approach a horizontal direction, and at last become perpendicular to the radii ab, ac , which will then be brought to form one and the same straight line, the theoretical force at this instant becoming infinite. The ratio of power to resistance in the case represented in the figure is as $mn : am$, or as the height of the plane is to its base; or $p : w :: \sec b - \cos b : \sin b$.—A carriage wheel in overcoming an obstacle acts upon the same principle. Let c , fig. 45, be an obstacle, and ag the line of draught. The weight, sustained by the axle at a , acts perpendicularly, and to overcome the obstacle this point must be raised to the position of b , vertically above it. At first the motion of the axle will tend in the direction of the tangent ad , and there will be equilibrium when $p : w :: dg : ag$. It will successively move in the direction of tangents at every point in the arc ab , until it will finally take the direction of the horizontal tangent fb , when the obstacle will be overcome. This action has also been explained upon the principle of the lever of the first kind. The obstacle is considered as a fulcrum supporting the bent lever acn , the arm to which the power is applied at the axle being the radius of the wheel, ac , and the other arm, cn , the horizontal distance from the obstacle to a vertical let fall from a . The

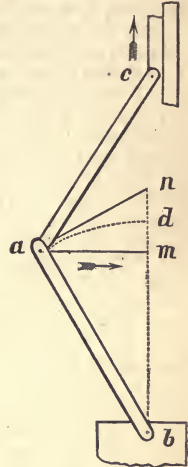


FIG. 44.

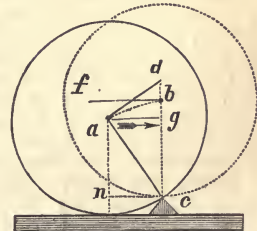


FIG. 45.

point n in this vertical is supposed to support the load. The practical length of the arm ac is the perpendicular drawn from c to the line of draught; thus, if the line of draught is in the direction dg , $p : w :: nc : gc$. The load, however, is actually supported by the axle at a , and the power is also applied at the same point, so that the analogy of the action to that of the lever is not as close as to that of the inclined plane.—For a further consideration of the science of mechanics, besides the works of Huygens, Newton, and others already mentioned, see L. N. M. Carnot, *Principes fondamentaux de l'équilibre et du mouvement* (Paris, 1803); James Renwick, "Elements of Mechanics" (Philadelphia, 1832); Poisson, *Traité de mécanique* (Paris, 1833); the Rev. H. Moseley, "A Treatise on Mechanics" (London, 1834); Christopher Bernoulli, *Elementarisches Handbuch der industriellen Physik, Mechanik und Hydraulik* (Stuttgart and Tübingen, 1834-'5); W. B. Carpenter, "Elements of Mechanical Philosophy" (London, 1844); Arthur Morin, *Leçons de mécanique pratique* (Paris, 1853); "Appleton's Dictionary of Mechanics" (New York, 1868); W. H. C. Bartlett, "Elements of Synthetic Mechanics" (New York, 1871); W. G. Peck, "Elements of Mechanics" (New York, 1873); and Thomson and Tait's "Natural Philosophy" (London, 1874). The reader may also consult *Bibliotheca Mechanico-Technologica*, by Engelmann (Leipsic, 1844).

MECHELN, or **Meckenen**, **Israel von**, a German engraver and painter of the latter half of the 15th century. From the difference in the style of the Mecheln prints, of which upward of 300 are known, it is almost certain that there were two artists of the name. Their works are among the earliest specimens of the art. About the latter half of the 16th century flourished an artist of the school of Cologne, who is generally designated as the "master of the Passion," from his chief work, a representation of the Passion on eight panels. Several other works by the same hand are extant in Germany, painted in the stiff Gothic style, with something of the manner of the Van Eycks. By some this unknown artist is supposed to have been identical with Israel von Mecheln the younger.

MECHERINO. See BECCAFUMI, DOMENICO.

MECHI, **John Joseph**, an English agriculturist, born in London, May 22, 1802. His father, an Italian, was a member of the English royal household. The son became a clerk in a mercantile house, speculated in a small patent, and in 1827 set up in business as a cutler. By the sale of a "magic razor strop," aided by liberal advertising, he acquired a fortune; and in 1840 he bought a farm of 170 acres at Tip-tree heath, Essex, where he made the experiments in scientific agriculture for which he became widely known. These experiments at first subjected him to much ridicule, but finally changed the farm from one of the most sterile into one of the most profitable. He collects

the manure in a vast reservoir, liquefies it, and distributes it by a steam engine, through subterraneous pipes, over all parts of the farm, which it fertilizes and irrigates at the same time. Mr. Mechi has been an alderman and sheriff of London, and was a commissioner to the Paris exhibition of 1855. He has published "Letters on Agricultural Improvements" (1845), "Experience in Drainage" (1847), and "How to Farm Profitably" (1859; 4th enlarged ed., 1871), &c.

MECHITAR. See MEKHITAR.

MECHLIN, or **Mechelen** (Fr. *Malines*), a city of Belgium, in the province of Antwerp, on the Dyle, 13 m. N. by E. of Brussels; pop. in 1870, 36,090. It is one of the railway centres of Belgium, four lines radiating from the town, which however presents a deserted appearance, vividly contrasting with the bustle at the station, half a mile outside the gates. Mechlin is one of the most picturesque Flemish cities. In the Grande Place are the cathedral and a statue of Margaret of Austria by Geefs. The principal public edifices besides the cathedral are the churches of Notre Dame, St. Peter and St. Paul, St. John the Baptist, St. John the Evangelist, and an English church; the archiepiscopal palace; the Beguinage, an asylum for aged widows; and the college. There are manufactories of woollens, linens, lace, beer, &c. The lace manufacture, formerly celebrated, has greatly fallen off both in quantity and quality. Mechlin is the seat of an archbishop, who is primate of Belgium. Its churches contain some fine paintings by Rubens and Vandyke.

MECHOACAN. See MICHOCACAN.

MECKLENBURG. **I.** A S. E. county of Virginia, bordering on North Carolina, bounded N. by the Meherrin river, intersected by the Roanoke, and drained by its tributaries; area, 640 sq. m.; pop. in 1870, 21,318, of whom 14,150 were colored. The surface is undulating and well timbered, and the soil generally fertile. The Roanoke Valley railroad terminates at Clarksville. The chief productions in 1870 were 83,033 bushels of wheat, 243,506 of Indian corn, 123,492 of oats, 11,288 of Irish and 12,512 of sweet potatoes, 2,166,628 lbs. of tobacco, 8,815 of wool, and 147,599 of butter. There were 1,479 horses, 767 mules and asses, 2,557 milch cows, 1,081 working oxen, 3,367 other cattle, 5,439 sheep, and 11,108 swine. Capital, Boydton. **II.** A S. W. county of North Carolina, bordering on South Carolina, bounded W. by the Catawba river; area, about 700 sq. m.; pop. in 1870, 24,299, of whom 10,721 were colored. It has an elevated surface and fertile soil, and contains several gold mines. It is intersected by the Charlotte, Columbia, and Augusta, the Atlanta and Richmond Air Line, and other railroads. The chief productions in 1870 were 69,826 bushels of wheat, 454,864 of Indian corn, 75,990 of oats, 12,159 of Irish and 18,774 of sweet potatoes, 125,939 lbs. of butter, and 6,067 bales of cotton. There were 2,017 horses, 1,822 mules and asses, 3,353

milch cows, 4,676 other cattle, 5,403 sheep, and 16,362 swine; 1 distillery, 11 saw mills, and 1 woollen mill. Capital, Charlotte.—The people of Mecklenburg took an early and spirited part in the resistance to Great Britain; and in May, 1775, they publicly renounced allegiance to the crown and adopted a declaration of independence.

MECKLENBURG, a territory of northern Germany, belonging to the German empire, divided into the grand duchies of Mecklenburg-Schwerin and Mecklenburg-Strelitz, bordering on the Baltic sea, Pomerania, Brandenburg, Hanover, Lauenburg, and Lübeck. The house of Mecklenburg is the oldest in Germany. The original inhabitants were of Germanic race, but were conquered during the great migration of nations by Slavic tribes. After long wars against the German monarchs, under the lead of native princes, the country was conquered about 1160 by Henry the Lion of Saxony, who divided it among his nobles, and gave a part of it to Pribislas, the descendant of a native dynasty, under the name of the principality of Mecklenburg. The reigning house was subsequently divided into two branches. The elder line was founded by John the Theologian, whose grandson Henry II. (or IV., 1302-'29) enriched it by the domain of Stargard. The sons of the latter, Albert and John, were made dukes in 1349; and a great-grandson of Albert became duke of the whole of Mecklenburg. Afterward the country was again divided into two lines, remaining so till 1628, when, on account of a supposed alliance with Denmark, Wallenstein was made ruler of the country. In 1632 the expelled dukes were restored to power by Gustavus Adolphus, and shortly afterward the final division of the country into the two parts took place.—**MECKLENBURG-SCHWERIN** has an area of 5,138 sq. m.; pop. in 1872, 557,897, chiefly Lutherans. A ridge of hills traverses the country, but the surface is generally level. It abounds in forests and lakes. Müritz is the largest lake, and Lake Malchin the most remarkable for its fine scenery. The chief river is the Warnow, which at Rostock expands to a breadth of about 2,500 ft., and falls into the sea at Warnemünde. The soil is fertile and well cultivated. Agriculture is the chief employment of the population. The principal product is wheat. Horned cattle and sheep are numerous, and the horses are celebrated. The number of vessels entering the ports in 1872 was 1,002, tonnage 113,740. The registered shipping comprised 426 vessels, tonnage 142,954. The legislature consists of 622 proprietors of *Rittergüter* or knights' estates, and 40 representatives of towns. Every two years the diet forms a joint assembly with that of Mecklenburg-Strelitz for common legislation. The public debt in 1872 was estimated at \$5,000,000, nearly half of which was caused by loans for the construction of railways. The country is divided into the provinces of Mecklenburg and

Wenden, the principality of Schwerin, the city of Rostock, and the lordship of Wismar. It contains 40 towns, the largest of which, and the principal trading port, is Rostock. Schwerin is the capital.—**MECKLENBURG-STRELITZ** consists of the dominion of Stargard or duchy of Strelitz (area, 909 sq. m.; pop. in 1872, 79,976) on the east and the principality of Ratzeburg (area, 144 sq. m.; pop. in 1872, 17,006) on the west of Mecklenburg-Schwerin. Stargard contains 53 lakes, of which the Tollen lake is the largest. The principal river there is the Havel, and in Ratzeburg the Trave. The government is the same as in Mecklenburg-Schwerin, excepting in Ratzeburg, which is not represented in the legislature. The grand duke is assisted by a cabinet. He is noted for his great wealth. No official accounts of the revenue and expenditure are published. The public debt is estimated at about \$1,450,000. Capital, Neu Strelitz.—In 1867 both grand duchies joined the North German Confederation, and in 1868 the Zollverein; and in 1871 they became parts of the German empire, toward the foundation of which the grand duke of Mecklenburg-Schwerin had contributed by his services in the Franco-German war. (See *FREDERICK FRANCIS II.*, vol. vii., p. 453.) By a special military convention concluded in 1872, the armies of both grand duchies were incorporated with that of Prussia. As the constitution of the empire guaranteed to every particular state a constitutional form of government, the liberals of Mecklenburg invoked the interference of the German Reichstag in behalf of the abolition of their feudal institutions. In consequence of the resolution passed by the Reichstag, the grand ducal governments submitted drafts of a new constitution to the diet; but in July, 1874, no agreement between the governments and the diet had been arrived at.

MECOSTA, a central county of the S. peninsula of Michigan, watered by the Muskegon and Chippewa rivers; area, 576 sq. m.; pop. in 1870, 5,642. The surface is undulating and the soil productive. It is traversed by the Grand Rapids and Indiana railroad. The chief productions in 1870 were 19,789 bushels of wheat, 15,734 of Indian corn, 27,805 of oats, 53,729 of potatoes, 47,510 lbs. of butter, and 3,176 tons of hay. There were 385 horses, 660 milch cows, 1,085 other cattle, 917 sheep, and 741 swine; 3 flour mills, and 2 saw mills. Capital, Big Rapids.

MEDALS. See **NUMISMATICS**.

MEDE, or **Meade**, **Joseph**, an English theologian, born at Berden, Essex, in October, 1586, died in Cambridge in October, 1638. He graduated at Christ's college, Cambridge, in 1610, and obtained a fellowship. His most esteemed work, *Clavis Apocalyptica*, appeared in Latin in 1627, and in English in 1643. This was the first rational attempt of an English theologian to explain the Apocalypse. A collective edition of his works was published in London by Dr. Worthington in 1672.

MEDEA, a mythical princess, a daughter of Æetes, king of Colchis, by the oceanid Idyia, or Hecate, daughter of Perses. She was famous for her skill in sorcery, and enabled Jason, with whom she had fallen in love, to possess himself of the golden fleece. (See ARGONAUTS.) Medea accompanied her lover to Greece, and lived with him as his wife, but was subsequently deserted by Jason for Creusa, daughter of Creon, king of Corinth. In revenge Medea destroyed her own children by Jason, and sent to Creusa a poisoned garment which burned her to death. Then, fleeing to Athens in a chariot drawn by winged dragons, she there married Ægeus, by whom she had several sons. Having been afterward detected in laying snares for the destruction of Theseus, she was driven from Attica, and went to Asia accompanied by her son Medus, who became the founder of the Median nation. Medea has been made the subject of tragedies both ancient and modern, among which are those of Euripides, Seneca, and Corneille.

MEDFORD, a town of Middlesex co., Massachusetts, at the head of navigation on Mystic river, and on the Boston and Lowell and a branch of the Boston and Maine railroad, 5 m. N. W. of Boston; pop. in 1870, 5,717. It manufactures tin ware, leather, rum, crackers, casks, cabinet ware, harnesses, woollens, cottons, buttons, bricks, carpets, oil silk, boots and shoes, &c., and was formerly noted for ship building. It has a savings bank, public library, reading room, weekly newspaper, 21 schools, besides a high school, and 11 churches, and is the seat of Tufts college. (See TUFTS COLLEGE.)

MEDHURST, Walter Henry, an English missionary, born in London in 1796, died there, Jan. 24, 1857. He was educated for the ministry, and in 1816, under the auspices of the church missionary society, started on a tour through India and Malacca, and resided chiefly in Batavia, Java, from 1822 to 1830. During this interval and for several years afterward he pursued his missionary labors also in Borneo and on the coasts of China. After a residence of two years in England, he settled in 1843 in Shanghai. Subsequently he passed six years in the interior of China, and in 1856 returned in ill health to London. Besides a Chinese version of the Bible, his principal works are: "Chinese Repository" (20 vols., Canton, 1838-'51); "Chinese Miscellanies" (3 vols., Shanghai, 1849-'53); a "Chinese and English Dictionary" (2 vols., Batavia, 1842-'3); and an "English and Chinese Dictionary" (2 vols., Shanghai, 1847-'8). His "China, its State and Prospects" (London, 1838), has been a text book for those interested in missionary enterprises in China.

MEDIA (Old Pers. *Mada*; Heb. *Madai*), an ancient country of Asia, bounded N. by Armenia, from which it was partly separated by the Araxes (Aras) river, and the Caspian sea, E. by Hyrcania, Parthia, and the desert of Aria, S. by Persia, S. W. by Susiana, and W.

by Assyria and Armenia. It thus corresponded nearly to the modern Persian province of Irak-Ajemi. It formed the westernmost part of the table land of Iran, being for the most part fertile, and producing wine, figs, and oranges, and an excellent breed of horses. The most important mountain range in the interior was the Caspian (now Elburz) mountains, the territory between which and the Caspian sea was inhabited by independent tribes. Media was well peopled, originally by Turanian Scythians. In the time of Herodotus, and according to his statement, it was occupied by six tribes, who are said to have been a kindred race to the Persians, that is, a branch of the great Aryan family. In the time of the Persian power they, or at least a large part of them, spoke the same language as the dominant race, and had the same laws, manners, and religion. But there is great difficulty in determining when the supremacy of the Aryan element over the original Turanian or Scythic began, how far the two were blended together, and what relation they occupied to each other during the period of special Median history. According to Ctesias, the Medes revolted from the Assyrians and became independent under Arbaces about 875 B. C.; but his whole story about the fall of that empire and the death of its king Sardanapalus is now discredited. About the same period the Medes first appear in real history, occupying the region S. of the Caspian, when the Assyrian monarch whose expeditions are recorded on the black obelisk in the British museum made the earliest authentic assault on their independence. The list of eight successors to Arbaces on the throne of Media given by Ctesias can find no credit, as his names and dates are at variance with those given by Herodotus. According to the latter, Media, having been for centuries under the sway of the Assyrian monarchs, afforded the first example of a successful revolt to the nations suffering under the same yoke, apparently in the latter half of the 8th century. The people, however, having elected no common chief, suffered greatly from anarchy until Deioces, a popular judge, secured by stratagem his appointment as ruler of the united state (about 708), by common consent of the Medes, when he founded a fortified capital, Ecbatana. He was succeeded by his son Phraortes, who, says Herodotus, "not being satisfied with a dominion which did not extend beyond the single people of the Medes," attacked and subdued the Persians, and with the united forces of these two nations engaged in war with the Assyrians, but perished with the greater part of his army about 633. The authenticity of this account of the first two Median reigns is rejected by Rawlinson as inconsistent with the monuments; but it seems probable that the principal facts of Herodotus can be reconciled with the monumental history, by supposing his Deioces and Phraortes to have been either half independent viceroys of the Assyrian monarchs, or rulers

in parts of Media which succeeded in conquering and maintaining their independence. According to Rawlinson, the Median kingdom was probably first established about 633 by Cyaxares, the third king of Herodotus. At all events, it was probably that monarch, generally regarded by Greeks and Asians as the founder of a dynasty, who made the Aryan element paramount in the kingdom, after a hard struggle against native and foreign Turanian tribes. The Aryan emigration from the east had for centuries been pressing upon the Turanian populations of the regions E. and S. of the Caspian, and under Cyaxares a violent struggle of the two races was after many years decided in favor of the former. This struggle Herodotus brings in connection with the invasion of Asia by the Cimmerians, relating that the Scyths, their pursuers, interrupted the successes of Cyaxares, the conqueror of Nineveh in alliance with Babylonia, and spread the terror of their arms as far as the confines of Egypt, holding sway over Asia for 28 years. A treacherous massacre is said to have terminated this sway, when Media, which under Cyaxares also waged war against Alyattes of Lydia, became the first among the nations of Asia, another empire being simultaneously founded by its Babylonian ally. The reign of Astyages, the son of Cyaxares, which lasted 35 years, was peaceful, but ended (about 558) with a catastrophe, which changed the united kingdom of "Media and Persia," as it is called in Scripture, into another styled Persia and Media, in which the people of the conqueror, Cyrus, became the predominant race. The difficulty, however, which arises from the fact of a Darius the Mede being represented in the book of Daniel as king of Babylon, has induced some critics to accept the relation of Xenophon, strengthened by that of Josephus, concerning the reign of a Cyaxares II., son and successor of Astyages, for whom Cyrus, his nephew, conquered Babylon, in preference to the detailed story of Herodotus; while others find Darius the Mede, not in a Cyaxares II., but in Astyages, who may have maintained a shadow of royalty under his grandson, Cyrus. (See DARIUS.) Both Media as a province, and its undoubtedly mixed population, continued prominent in the history of the new Aryan empire, though two great struggles for the recovery of independence, under Darius Hystaspis and Darius Nothus, failed. Many of the highest offices in the state were held by Medes; and the Scythic inscriptions on the Persian monuments prove the importance which was attached to the populations of the ancient Median provinces. The relation of the influential caste of the Magi to the Median tribe of the same name, as well as of the Scythic element of the Medo-Persian religion to the Aryan, is not yet satisfactorily cleared up. The Median religion appears to have been Magism, while that of the Persians was Mazdeism. Desirous of conciliating the religious notions of the Tu-

ranian people who formed a large element in the population of Media, the Magi, the great ones, or priests, combined the worship of Ormuzd with that of Ahriman, whom they identified with the Turanian Afrasiab. (See ORMUZD, and ZOROASTER.) Semitic races formed also a constituent part of the population of Media, and hence the Magi introduced also the worship of the gods of Assyria and Elam. It seems that the Magi also practised sorcery and incantations, which pure Zoroastrianism expressly forbids. Otherwise but little is known of the state of Median civilization, arts, and religion. Median architecture, according to Rawlinson, appears to have possessed a barbaric magnificence, but not much of either grandeur or beauty.—After the Macedonian conquest, and the death of Alexander, a governor of the latter, Atropates, made himself independent in the N. W. part of Media, hence called Atropatene, which continued to exist as a kingdom down to the time of Augustus, while Great Media was under the successive rule of the Seleucidæ and Parthians. Both parts of ancient Media were again united under the Neo-Persian kings, and its subsequent history is blended with that of Persia.—See George Rawlinson, "The Five Great Monarchies of the Ancient Eastern World" (London, 1862-'8); Lenormant, *Manuel d'histoire ancienne de l'Orient* (Paris, 1868-'9); Spiegel, *Erânische Alterthumskunde* (Leipsic, 1871-'3); and Duncker, *Geschichte des Alterthums* (4th ed., Leipsic, 1874 et seq.).

MEDICAL ELECTRICITY, or Electro-Therapeutics, the therapeutical application of the various kinds of electricity. The attempt to employ electricity in medicine dates as far back as the knowledge of the phenomena of electricity itself. The history of electro-therapeutics may be divided into four periods: 1, the period before the invention of the electrical machine and Leyden jar; 2, from the invention of this machine to the discovery of galvanism; 3, from the discovery of galvanism to that of magneto-electricity; 4, from this last discovery to the present time. Of the first period little is known. The ancients occasionally ate of the raja torpedo on account of its supposed curative properties, and 1,000 years ago the women of western Africa are said to have placed their sick children in pools of water containing these fish. Scribonius Largus, a physician of the time of the emperor Tiberius, employed electric fishes for the cure of gout, and Pliny and Dioscorides speak of electricity as a therapeutical agent in several diseases. It was not till about the middle of the 18th century, or a century and a half after the observations of Dr. Gilbert of Colchester in England, that much was done in the way of applying frictional electricity in electro-therapeutics. About this time a German named Kratzenstein is said to have restored the use of a paralyzed finger by electricity, and experiments were made in the Vienna hospital under

the direction of De Haen with considerable success. In France Jallabert, Sigaud-Lafond, Bertholon, and others became enthusiastic advocates of its application; and especially Mauduyt, who made a favorable report to the royal society of medicine in 1773. The agent was employed in every form then attainable—in baths, in electric jets and streams, and in shocks. Cavallo, in his "Essay on the Theory and Practice of Medical Electricity" (London, 1780), collected all the various ideas of his day on the subject, by which it was credited with being of service in paralysis of the muscles, impaired vision and hearing, chorea, epilepsy, chronic rheumatism, scrofulous enlargement of the glands, and in reanimating the apparently dead. The natural magnet had been used by Paracelsus, and its mysterious properties were greatly extolled by him; and the use of artificial magnets by Maximilian Hell of Vienna drew considerable attention to this form of electricity as a curative agent. But the magnet, unless employed to induce electric currents, is almost inert for this purpose, and consequently practical men could never from this, or from frictional electricity alone, derive that degree of benefit commensurate with the inseparable disadvantages from delay, exposure of person, &c., attending their use. The discoveries of Galvani and Volta gave a new electric force, and the controversy between their followers revived the interest of the medical profession and physicians generally in electro-therapeutics. In 1797 Humboldt published his celebrated work, *Ueber die gereizte Muskel- und Nervenfasern*, in which the power of galvanism to change the secretions was shown, as also the dependence of nervous sensibility upon external circumstances, such as muscular exertion and diseased condition. The book exerted a profound influence, not only upon the development of the science of medical electricity, but upon the progress of physiology. The resuscitation of persons inanimate from suffocation or nervous derangement attracted about this time much attention, and Hufeland and Sömmering made a series of experiments with special reference to this subject, arriving at the conclusion that the phrenic nerve offered the best pathway to the galvanic current for restoring suspended animation. Pfaff, Reil, Humboldt, and others also recommended galvanism as an efficacious agent in cases of paralysis of certain organs, and Valli proposed it as a test in cases of apparent death. The introduction of Volta's pile in 1799, by which the intensity of the galvanic current was greatly augmented, gave an additional advantage, as by it penetration into deeper parts of the body was possible. Loder, Bischoff, Lichtenstein, Hers, and others directed their attention to its application in cases of paralysis of the extremities and nerves of special sense. At the same time Prof. Schaub in Cassel, and Eschke, director of the institution for the deaf and dumb in Berlin,

employed it in cases of impaired hearing and of deaf mutes. But owing to the frequent failures of electricity to realize the hopes of its friends, the great body of scientific physicians were slow to recognize it as a trustworthy therapeutical agent, and it fell into the hands of charlatans, who offered the voltaic pile for sale as a panacea. The circumstance that mesmerism, which had made its appearance some time before, was connected in the public mind with electricity and magnetism, had the effect of discouraging practitioners from making investigations in that direction. Faraday's discovery of inductive electricity in 1831 was the commencement of a new era in the history of medical electricity. The construction of magneto-electric machines by Saxton, Keil, Ettinghausen, and Stöhrer offered facilities for the use of electricity in medicine not before known; but these machines were costly, and Wagner, Rauch, Duchenne, and Du Bois-Reymond made cheaper voltaic apparatus of considerable intensity; and physicians and scientific men generally employed much of their time in making experiments. Among the English who engaged in this pursuit were Marshall Hall, Golding Bird, Stokes, Phillips, Graves, and Donovan; among the French, Poiseuille, Pétrequin, Masson, Duchenne, and A. Becquerel; and among the Germans, Weber, Heidenreich, Richter, Moritz Meyer, Schultz, Erdmann, Baierslacher, Eckhardt, Remak, Althaus, and Rosenthal. Pravaz was the first to conceive the idea of curing aneurism by galvanopuncture; the English surgeon Liston was the first to apply the method to the human subject; the Italian Cinisilli was the first to make a successful operation.—The manner of applying electricity in therapeutics has been various, and at present differs in different cases. The earliest method of using the frictional electricity of the ordinary machine was to take the sparks from the prime conductor, soon after which it was the practice to take sparks from the patient, who was placed upon an insulated stool. On the introduction of the Leyden jar, shocks were taken from this apparatus, but no great degree of system in its application was ever attained. The most remarkable and practical successes of electricity have perhaps been in the domain of surgery, by the employment of electric currents of sufficient quantity to raise platinum wire to a white heat. This mode of employment cannot be strictly called therapeutic, as the action is simply one of heat, and possesses no intrinsic properties beyond those of the actual cautery. But it is applied in situations where it would be impossible to apply the same degree of heat produced in any other manner. Galvano-causty, as this operation is called, is employed for extirpating and abolishing tumors and diseased growths. A battery of from 16 to 24 of Grove's cells, or an equivalent battery of any form, is all that is required to produce the current. (See GALVANISM.) Electrodes of

platinum wire of different thicknesses, and of various forms and lengths, to meet the requirements of different cases, are connected with portable conducting wires in such a manner as to admit of the most convenient application. In electro-therapeutics two forms of current are used: the direct battery current, and the induced, electro-magnetic, magneto-electric, or faradic currents. (See ELECTRO-MAGNETISM, and MAGNETO-ELECTRICITY.) When the direct current is employed, the operation is called simply galvanization; when the induced or interrupted current is used, the process is called faradization. The direct current may be used of such strength and so applied as to produce decomposition of the fluids and solids of the parts to which it is applied, an operation which has received the name of electrolysis. Needles of various forms and sizes are employed as electrodes. They are inserted into the diseased parts, and the therapeutic results are dependent in a great measure upon the fact that diseased parts are more readily destroyed by electrolytic action than sound parts. Batteries for electrolytic purposes should be coupled for intensity, as quantity arrangement produces too much heat, and has not sufficient intensity to overcome resistance. The general effects of electricity upon the various parts of the body are as follows: When a current from 12 or 16 Grove's elements is passed through the brain, by placing one electrode upon some part of the cranium, which should be slightly moistened, and the other upon some other part of the body, as along the spinal column, or in the hands or under the feet, flashes of light appear on breaking the current, and a metallic taste is perceived. M. Erb has demonstrated that the skull offers no obstruction to the passage of the current. Galvanization of particular parts of the brain will excite contractions of the muscles. Matteucci showed that electric stimulation of the *crura cerebri* is followed by muscular contractions; but the most marked effects of electricity are upon the special senses. If a metallic plate connected with one electrode is placed upon the forehead and the other over the infra-orbital nerve, it will cause the sensation of a vivid flash of light. Galvanic stimulation of that part of the sympathetic system supplying the iris will produce dilatation of the pupil. The sense of hearing is also intensified, and favorable results have been obtained by repeated applications of the continuous current through the parts containing the different portions of the ear. The olfactory nerve is not affected by the induced or faradic current, but a moderately strong continuous current will produce a peculiar odor, which is not to be confounded with that of ozone, afforded by the friction machine. The sense of taste is easily affected by the galvanic current. A simple experiment consists in placing a plate of zinc beneath the tongue and a plate of a more negative metal,

as copper or silver, above it, and bringing the edges of the two together, when a flash of light and a metallic taste will be perceived. Electrization of the motor nerves results in a contraction of the muscles which are supplied by them, which occurs upon the closing of the circuit, ceasing when the current is broken. The effect is greatest when the negative electrode is applied to the nerve and the positive to the muscle. Ritter found that when the current was applied in the direction of the nerve its excitability was diminished, but in the other direction the irritability was increased. If the electrodes are applied to the surface of the body, a sense of warmth will be felt in the part. A strong current will produce a sense of prickling or tingling, which may increase to a state of extreme pain. With the interrupted or faradic current, if the breaks are made slowly, the sensation will differ from that which occurs when they are very rapid; and this will vary with the part operated upon, and with the variety of electrode employed. A moist sponge may occasion only a slight disturbance; but a bundle of pointed wires may create an intense sensation. The amount and distributions of the nerves beneath the skin will also be followed by a difference of sensation. Remak holds that the nearer the nerves are to the brain the greater will be the excitability. The application of the continuous current for any great length of time will diminish sensibility. Faradization and static electricity have but little influence upon the sympathetic system of nerves; but the continuous current from a battery of many couples may be passed through many parts of it. When the cervical portion is electrically insulated, dilatation followed by contraction of the pupils occurs, the pulsations of the heart are less frequent, and the tension of the arterial walls is diminished. That the vaso-motor system of nerves may be decidedly affected appears from the fact that galvanization excites the peristaltic action of the intestines, and greatly affects the calibre of the capillaries and larger blood vessels. The stomach and intestines and other abdominal organs are readily influenced by applying the electrodes at either side of the abdomen, or by applying one electrode over the abdomen and the other along the spinal column. The continuous current sent through the splanchnic nerves increases the peristaltic movements of the intestines, while faradization diminishes them. The details of the practice of electro-therapeutics, especially from the fact that changes are liable to be made, are purposely omitted in this work.—See "Electricity in its Relations to Practical Medicine," by Dr. Moritz Meyer, translated and edited by W. A. Hammond, M. D. (New York, 1869); "A practical Treatise on the Medical and Surgical Uses of Electricity," by George M. Beard, M. D., and A. D. Rockwell, M. D. (New York, 1871); "Clinical Electro-Therapeutics," by Al-

lan McLane Hamilton, M. D. (New York, 1873); and "A Treatise on Medical Electricity," by Julius Althaus, M. D. (Philadelphia, 1873).

MEDICAL JURISPRUDENCE, called also legal or forensic medicine, the employment of the principles of medical science in the administration of law. In its relations to jurisprudence, medical learning is a branch of evidence in which the physician or surgeon is called in as an expert. There are traces both in the Jewish and Roman systems of the recognition of medical science in the application of laws; but forensic medicine cannot be said to have attained the dignity of a science until many centuries after the completion of the Justinian code, certainly not until anatomy was studied in the human subject in the 14th century; perhaps not before the publication of the Carolinian criminal code in 1552. The Roman law had referred all medical questions which arose in legal processes to "the authority of the learned Hippocrates." The code of Charles V. enjoined the magistrate, in all cases of doubt respecting asserted pregnancy, infanticide, the means of homicide, and in other cases of death by violence, to consult the opinions of medical men. During the latter part of the 16th century and the earlier part of the 17th, legal medicine made marked progress. Ambroise Paré published during that time a treatise upon tardy births. Fortunatus Fidelis compiled and published at Palermo in 1602 all that was then known of medical science. At Rome, about 20 years later, Paolo Bacchia, or, as he is usually called, Paulus Bacchias, commenced the publication of his *Questiones Medico-Legales*. This work appeared in successive volumes between the years 1621 and 1650, and deserves the merit of first worthily exhibiting legal medicine as a science. In France in 1609, under a patent of Henry IV., two surgeons were appointed in every considerable town to make examinations and reports in all cases of wounded or murdered persons. The application of the so-called hydrostatic test of Galen to cases of supposed infanticide, which had been suggested by Harvey, was discussed in several disquisitions by Bartholin (1663), Swammerdam (1677), Jan Schreyer (1682), and toward the close of the century by Bohn, in his treatise *De Renunciatione Vulnere*. In a later work Bohn treated of the office of the physician as expert in judicial tribunals. France produced during this time no very celebrated works on forensic medicine, but the *Doctrine des rapports en chirurgie* of Blégné (1684), and the more useful book of Devaux on the same subject, are honorably mentioned in this branch of the science. In 1722 Valentini contributed to the literature of the science the *Pandectæ Medico-Legales*. Between 1725 and 1747 were issued at Halle the successive volumes of the *Systema Jurisprudentiæ Medicæ* of Albertini. This work was followed by the *Institutiones Medicinæ Legalis vel Forensis* of Tischmeyer,

which was used for a long time as a handbook in the German universities, and formed the text of Haller's lectures, which were published after his death in 1782 and 1784. The *Elementa* of Plenck (1781) and the *Systema* of Metzger (1795) are commended by writers of high authority. So too is the collection of Metzger's constitutions or opinions, many of which embody the results of his studies in mental disease as a branch of legal medicine. The *Collectio Opusculorum*, edited by Schlegel, and embracing upward of 40 dissertations by German authors on various topics, was one of the most valuable additions made during the 18th century to the learning of the science. In the latter part of the 18th century, infanticide was made the subject of elaborate research by Daniel and Plouquet, among others, the latter of whom published an essay upon the evidences of respiration in new-born infants; and by Metzger, Portal, and Camper, of whom the last wrote upon the signs of life and birth in new-born infants, and upon the causes of infanticide. During the same period the eminent French surgeon Antoine Louis, both by private dissertations and by his opinions pronounced before the tribunals, contributed to the illustration of some of the most difficult topics in legal medicine. Among the former are his memoirs upon tardy births, on the certain signs of death, on drowning, and on the mode of distinguishing between suicide and assassination in the case of a body found hanged. But his opinions, many of which are collected in the *Causæ célèbres*, present perhaps the clearest evidences of his genius. A valuable memoir upon death from blows or wounds was read by Chaussier at Dijon in 1789, and the next year he delivered there a course of lectures upon legal medicine. Shortly before the close of the century Fodéré published *Les lois éclairées par les sciences physiques, ou traité de médecine légale et d'hygiène publique*. This treatise displays the entire system of the science. Dr. Parr published in England in 1788 the "Elements of Medical Jurisprudence." This book was a mere compilation from continental authorities, but was at the time the only English work upon the subject. In the first year of the present century, the first lectures in Great Britain upon medical jurisprudence were delivered at Edinburgh by Dr. Andrew Duncan, and in 1806 the first professorship was established in the same city, and conferred upon Dr. Andrew Duncan the younger. The most important accessions to the science of legal medicine in recent times are those derived from studies of mental disease, and the application of the knowledge thus obtained to determining questions of legal responsibility; and from investigations into the nature and effect of poisons, and the mode of detecting their presence in the human body. The first systematic work of this century is the posthumous one of Dr. Mahon (1807), professor of legal medicine at Paris. In 1808 Marc pub-

lished a translation of the German work of Rose on medico-legal dissection, to which he added valuable original notes and essays. Fodéré in 1813 issued a second and much enlarged edition of his treatise. Of a far higher character than any work which had preceded it was the *Toxicologie générale* of Orfila, which appeared in 1813-'14, and was followed some years later by his *Leçons de médecine légale*. Orfila rendered the most eminent services to the science, and particularly in the department of toxicology. The elaborate treatise of Devergie made still further advances alike in the theory and practice of legal medicine. Briand, Capuron, Biessy, Esquirol, and Marc are authors of learned treatises or of dissertations on single subjects. But any sketch of the French literature upon this subject would be incomplete without mention of the *Annales d'Hygiène publique et de Médecine légale*, a quarterly journal, which from its first appearance in 1829 to the present time has been supported by the ablest medical men of France, and is an invaluable repository of information on the various branches of medical jurisprudence. The Germans still maintain their high rank in this science. Schmidmüller, Wildberg, Gmelin, Remer, Bernt, Henke, and many others have made the most various and valuable additions to the learning of medical science and jurisprudence. The principal Italian authors of the present century are Tortosa, Martini, and Barzelotti. In 1818 Dr. Male produced the first respectable English work on forensic medicine. More comprehensive and better in many respects than any which had preceded it, was the treatise of Dr. John Gordon Smith (1821). Two years after appeared the more formal and elaborate work, the result of the combined labors of a lawyer and a physician, Messrs. Paris and Fonblanque. Dr. Christison's works on poisons are of the highest excellence. Haslam on insanity, Hutchinson on infanticide, Watson on homicide, Gavin on feigned diseases, Taylor, Guy, and Traill, are authors of high eminence in their various specialties. Lectures upon medical jurisprudence were first delivered in America in 1804 at Columbia college, by Dr. James S. Stringham. In 1815 Dr. T. Romeyn Beck was appointed to lecture on the science in the western medical college, and not long after Dr. Walter Channing received a similar appointment in Harvard college. American authors have furnished some of the very best works upon this science. The well known work of Dr. Beck (12th ed., 1863) was pronounced by Dr. Traill of Edinburgh the best book on the general subject in the English language. American editions of various English works, and the publication of the excellent treatises of Wharton and Stillé, of Dr. Ray's book on insanity, of Elwell on malpractice, of the "American Journal of Insanity," and the "Journal of Psychological Medicine," maintain the high reputation of our country in its culture of medical science

and jurisprudence.—The very general survey of legal medicine which is here proposed will exclude all notice of medical police or public hygiene, and will be exclusively limited to a brief review of the more prominent branches of the science. Following the division of Briand, the subject may be conveniently arranged under three heads: the first embracing those branches which concern the reproduction of the species; the second considering injuries to health and life, the different forms of death by asphyxia, and the nature and effect of poisons; and the third examining mental affections.—In the male, absolute and incurable impotence may arise from total absence, unnatural form, or paralysis of the organs of generation. Curable conditions may be the consequence of disease or sensual excesses, or of slight malformation which can be relieved by surgery. Accidental and temporary incapacity may be caused by nervous or malignant fevers, particularly if they affect the brain and are accompanied by great debility, all affections of the head and spinal marrow, palsy, apoplexy, and the like diseases. This class of causes usually comes to be considered upon questions of contested paternity; for if it appear that any of these existed at the time of the child's conception, the presumption is strong against its legitimacy. In the female, malformation may render intercourse impossible. If it existed at the solemnization of the marriage and be incurable, it is sufficient ground for divorce. Female impotence may also be caused by diseases which may yield to medical treatment. In two instances familiar to the theory of the common law, though rare perhaps in its administration, medical testimony may be invoked by the courts upon the question of pregnancy: first, where a widow is thought to feign herself pregnant in order to supply a supposititious heir to an estate; and secondly, where a female condemned to death is supposed to be in that condition, for her execution will be delayed if she be quick with child. But in other respects, and particularly in relation to abortion and infanticide, the existence of pregnancy may be a significant fact. In respect to the crimes of abortion and infanticide, and also with reference to civil cases, when questions of heirship are involved, it is important to consider the signs of a child's death before or during delivery. From the sound health of the woman, and the usual signs of a healthy pregnancy, nothing can be conclusively presumed respecting the life of the fetus; and on the other hand, though violence and those other causes which tend to produce miscarriage may and usually do destroy the fetus, yet infants sometimes survive all these. The signs of death during pregnancy are numerous, and yet equivocal. Auscultation is one of the surest means of detecting fetal life. After the birth, the physician can judge from the appearance of the body, from the condition of the flesh, from its color, from the condition of the umbilical

cord, and of the bones, whether the infant was dead or alive at delivery. The successive stages of foetal life, as they are marked by the size, weight, and development of the organs and functions of the child, will throw much light upon the matter in question. In its latest researches science has found that the changes in the brain furnish an index of the general development. Yet all inferences derived from the structure and dimensions of the fœtus will be modified and controlled by considering the age and vigor of the mother, her mode of life, and perhaps the climate in which she lives. All systems of law contain provisions respecting newly born infants. To succeed to property, according to the Roman law, the infant must be perfectly alive. The English law makes a like requirement. By the French civil code the child must be viable, or capable of life, in order to be capable of inheriting; and on the authority of the most eminent surgeons and jurists of France, life, or being born alive, means complete and perfect respiration. The viability of a child, that is, its capacity of life, comes then to be considered in questions of property, and of the division of inheritances; for a child which is declared by medical science to have been viable may be presumed to have lived, and so to have inherited. "It is now very generally conceded," says Beck, "that no infant can be born viable until 150 days, or five months, after conception. The instances of exception to this rule are questionable; indeed, the survival of infants born at six, seven, or even eight months after conception, is by no means frequent." The criminal destruction of the fœtus while still in the womb, generally described by its consequences as abortion, is more fitly named fœticide. (See ABORTION.) The duty of the medical expert in cases of supposed fœticide is to determine whether the substance expelled from the womb be really the product of conception, and whether the causes of miscarriage were natural or artificial.—Infanticide is the murder of a child born alive. Here the medical examiner must address his inquiries first to the appearance of the body in order to determine whether it was born alive. If that be clear, he will seek to determine how long it lived, and the means by which it came to its death. These inquiries will naturally involve an examination of the alleged mother. Proof that life has existed in the child may be derived from the effects of respiration upon some of the organs of the body. In a child which has breathed completely and fully, the thorax will be found expanded and the diaphragm more or less depressed by the inflation of the lungs; but these signs alone are not of much value. Respiration will also have distended the lungs and increased their volume, and will have changed their color from the brownish tint of the foetal lungs to a pale red or scarlet color. After respiration the lungs become soft and spongy, and they crepitate more or less upon

pressure. The hydrostatic test is often applied. Galen had taught that by inspiration the lungs are rendered specifically lighter, and in modern times the test was first applied by Schreyer in 1682 to cases of suspected child murder. In the course of experiments it has been found that the lungs may float from other causes than respiration, as for example from putrefaction and the artificial introduction of air. But, observing certain precautions, it may be certainly known to what cause the buoyancy is due. If, says Beck, with such precautions it be found that the lungs float in the water, as well with the heart attached to them as separate from them, and if when cut into pieces each fragment floats, then the proof is strong that the infant enjoyed perfect respiration. Something may also be concluded, though not with much certainty, from the character of the blood found in the body, but more from the changes in the blood-circulating organs which are known to be wrought by the establishment of respiration, as, for instance, in some of the vessels and ducts of the heart, and in the arteries and veins of the umbilical cord. The separation of this cord, in the living child, is preceded by several stages of desiccation; and if this characteristic be present, its condition will afford evidence of the infant's age. To the validity of these indicia, so far as they tend to show the fact of life, it has been objected that the child may have breathed during delivery, and yet have died before it was fully born. It is replied to this, that the fact of breathing during birth affords the best presumptive evidence that the infant was born alive, and that the marks of any accidental cause of death will generally be discovered on inspection. More than that, respiration in such cases is commonly imperfect, and the objection will therefore have but little weight where the body presents the appearances which are induced by complete respiration. If the examination lead to the conclusion that the child was born alive, the means of death must next be determined, and whether they were innocent or criminal. The omission to tie the umbilical cord, permitting fatal hæmorrhage by its severed vessels, may be a cause of death. In such a case the body presents externally a singular paleness, and a peculiar waxy appearance. Internally is observed a loss of color in the muscles and viscera, and absence of the usual quantity of blood in the heart and blood vessels. Exposure to cold immediately after birth, want of proper nourishment, the infliction of blows and wounds, the thrusting sharp instruments into various parts of the body, are frequent modes of child murder. In cases of strangulation, suffocation, and poisoning, the indications of the cause of death are evident, and are suggested under the proper divisions of this article. It must be remembered also that accidental causes attendant upon birth, congenital disease, malformations or defects of internal structure, may deprive the child of life

or render it incapable of living. The mother may have been overtaken by the pains of labor when alone and unassisted, and then there are many chances against the safe delivery of the infant. Fainting or convulsions, which sometimes attend labor, may render her incapable of ministering to the first wants of her child; unskilful and imperfect ligature of the umbilical cord may produce death. An examination of the supposed mother has already been suggested.—In determining questions of legitimacy, the consideration of premature and tardy births necessarily arises. The ordinary period of gestation, derived from accurate data, is fixed at ten lunar months, or 280 days. It is admitted on high authority that this time may be exceeded, but it has been suggested that the apparently exceptional cases may be explained by the fact of inaccurate computation. Still it is to be remembered that the human fetus is ordinarily expelled only when it has attained sufficient development, and that, as this may be delayed by disease or other causes, it is not strange that delivery may be for a longer or shorter time deferred. Whether a child born before the time expected is to be regarded as legitimate, has been already incidentally discussed. It has been seen that the best authorities deny that a perfectly natural child can be born in less than seven months after conception. The absence or incapacity of the husband during this period, and all other causes which render intercourse impossible, tend strongly to prove illegitimacy of the child. Births occurring at 13 and even 14 months after an alleged coition have been sometimes claimed to be legitimate. This topic of protracted gestation has been abundantly discussed by medical writers. It must suffice here to say that, though the theory seems to be ably opposed by many, it is yet favored by a majority of the authorities, among whom are included Baccias, Haller, Petit, Fodéré, Capuron, Orfila, and others of almost equal eminence. It may be added that, of the cases cited in support of this theory, the best authenticated are those in which the ordinary period of gestation was exceeded only by three or four weeks.—When a person is found dead under circumstances which render the cause of death doubtful, the medical expert may be called upon for an opinion whether death resulted from natural causes, or from violence; and, if by violence, whether that was self-inflicted or by the hands of an assassin. Under this division of our subject we shall notice some of the more usual and characteristic phenomena observed in cases of death by blows and wounds; by asphyxia, considering here drowning, hanging, and suffocation; and finally, by poisons. The appearances in the body which are caused by effusions of blood will attract the early attention of the examiner. When a blow or contusion is sufficiently violent to rupture blood vessels, the effused blood spreads into the cellular tissues and forms ecchymosis. The intensity and grad-

nation of color in these spots give clear indications of their cause, and the freedom of the hæmorrhage shows that they were produced during life. Ecchymosis is named traumatic when, as is usually the case, it proceeds from external causes, and spontaneous when it is the effect of internal violence. From this must be distinguished the post-mortem appearances caused by suffigation. This is the term applied to the determination of the blood, merely as an effect of gravitation, into the lower lying portions of the dead body, and into the capillary blood vessels, and not into the cellular tissue. Ecchymosis may be imitated on the dead body within a short time after life is extinct; but very violent blows inflicted then will produce only the same effect as slight contusions during life. The body may plainly show, or dissection may disclose, that death was caused by wounds, that is to say, in the language of legal medicine, by a lesion of any part of the body. It may be remarked in passing that, in law, a wound means a breaking of the skin, at least, by the application of extreme violence. A division of the cuticle alone is not sufficient. The true skin must be penetrated, though there be no effusion of blood. In surgery, a wound means a solution of continuity, or disruption, in the fleshy parts. The first inquiries of course will be whether the wounds discovered were self-inflicted, or resulted from accident, or were given by a homicide. The position and direction of the injuries will be noted. The presence of many wounds argues violence by another hand than that of the deceased. The suicide generally directs the hurt to a single vital point. A wound made by a cylindrical and pointed instrument has distinct angles. A cut is larger than the cutting edge, and in the living body is always accompanied by some effusion of blood. A wound by a perforating instrument is generally smaller than the instrument which inflicted it. The entrance made by a ball is distinguished by the regular roundness and depression of its edges; the exit wound is torn and ragged. The former is also larger than the latter. The spiral motion of a rifle ball causes a more ragged wound than that of a ball from a smooth-bored arm. A single round wound can be produced by a shot charge only when it is fired at a distance of 10 or 12 inches, and then the injury is not the same as that of a ball, but is more extensive and more serious. The examination of spots supposed to be made by blood may lead to important discoveries. Blood washed from linen into water imparts to it a deep red color; boiling produces a muddy brown precipitate which is to be subjected to chemical tests. In fresh blood the microscope reveals the presence of red flattened disks, which are the blood disks, and among these, more rarely, the rounded colorless lymph globules. These latter may still be observed under the microscope in the water in which dried blood has been softened; the blood disks are less easily obtained. It is often a

question for the medical expert, when disease has succeeded to the injury, whether death resulted from the one cause or the other. If malignant or inflammatory symptoms follow upon slight wounds, the inference is ordinarily not difficult that the injury was not the cause of death. The habitual use of intoxicating liquors tends to induce a diseased condition of the system, and in a state of actual drunkenness the vessels of the body are in that condition in which an external injury is apt to produce rupture, and a less violent blow will cause it than would otherwise be required. Legal responsibility rests on the clear and direct consequences of the injury inflicted. This principle must always be borne in mind. For disease, though developed in organs far from the seat of the wound, may yet be its immediate result; as, for example, injuries on the head may promote a deposition of pus in the lungs, or give rise to abscesses of the liver; and on the other hand, death may result from improper medical treatment, or from the negligence or excesses of the injured party himself. (For the subject of malpractice, see *SURGERY*.) Though external marks fail, the skilful anatomist may discover upon dissection internal signs of mortal injuries. Blows or wounds upon the surface of the body may possibly rupture the heart. Ruptures of aneurisms may be produced by the excitement of passion, and laceration of the spleen or liver by a fall or other sudden external violence. Death from starvation is characterized by distinctive phenomena. The body is extremely emaciated, and, even though death were recent, exhales an acrid and fetid odor; the eyes are red and open, the tongue and throat dry, the stomach and intestines empty, and the gall bladder distended with bile; the blood vessels and internal organs are comparatively destitute of blood.—When life has been destroyed by the inhalation of noxious vapors, as for instance of carbonic acid or sulphuretted hydrogen gas, the head and face are found to be swollen, the eyes protruded, and the tongue fixed between the teeth. The face, if observed soon after death, may be pale, but generally soon becomes livid. The blood vessels of the head and lungs and the right vessels of the heart are filled with dark fluid blood. Pure carbonic acid gas is irrespirable, and inhalation of it causes death rather by asphyxia than by poisoning. When mixed with atmospheric air, 20 per cent. of this gas is very promptly fatal to life, and even a smaller proportion may produce the same result. Death from asphyxia is caused in various ways. When respiration is checked by mechanical compression of the organs which perform that function, or when it ceases either from want of air, as in cases of suffocation and strangulation, or from failure of vital air, and the inspiration of mephitic or deleterious gases, death is caused by asphyxia. Properly speaking, death ensues in those cases from non-aëra-

tion of the blood. It is preceded and accompanied by marked phenomena, more marked and evident in proportion to the rapidity with which death advances. In a violent struggle for breath, the eyes become distended, the veins swollen, and the face is fully suffused. On dissection, the pulmonary vessels and the right auricle and ventricle of the heart are found charged with blood, the liver, spleen, and kidneys are gorged, and the lungs expanded. In cases of less violent death, where, for example, it is brought about by inhalation of noxious gases, these appearances are less strongly marked.—Hanging sometimes causes death by producing congestive apoplexy, the pressure of the cord preventing the return of blood from the brain, while it does not check the circulation by the intervertebrals; but more frequently the destruction of life is due to asphyxia. Luxation or fracture of the cervical vertebrae speedily causes death. The signs of strangulation are a livid depressed circle upon the neck, made by the cord; the face is distorted; the eyes are open and protruded; the face, shoulders, and chest swollen. The ecchymosis produced by the cord is an important sign, for, as has been already observed, ecchymosis is possible only when contusion of the tissues takes place in the living body; yet in inferring the mode of death it is to be remembered that as death in hanging may suddenly result from luxation, the cord may have had no time to act on living tissues. The condition of the genital organs also affords very important proof of death by hanging. The color of the countenance is also to be regarded. If the trachea or larynx was alone compressed, the face is pale; but when the veins of the neck were pressed, as by the cord, and the heart continues its action for some time, the blood is propelled into the head and causes suffusion of the face. The question may arise whether, if the deceased came to his death by hanging, it was his own work, or the work of a homicide. An examination of cases of suicide has shown in a large proportion of them the absence of ecchymosis; and this because from the employment of less violence the contusion of the neck was less. Fracture of the vertebrae of the neck is often caused in execution by the fall of the body or even by force which is sometimes applied by the hangman. But luxation is of course not conclusive evidence of homicide. An examination of the position of the body and of the objects which surround it, of its elevation above any possible support, and any marks which show resistance, must be made in all suspected cases. In strangulation, in its ordinary sense, death results not from fracture of the vertebrae, but from interruption of respiration. This is a rare mode of suicide, and when appearances indicate that it was the means of death they raise a violent presumption of assassination. Because death ensues from interruption of the breath, the mark of the cord must be quite distinct, and is

rather horizontal than oblique. Bruises of peculiar form around the neck may show that strangulation was effected by the hands. It is impossible that these should have been made by the suicide, because the hands lose their power as insensibility advances. But in cases of hysteria, apoplexy, or epilepsy, the sufferer may in his agony have pressed the hands to the throat, and in this way have made the marks which give rise to a suspicion of murder.—Obvious and distinctive marks are, says Dr. Christison, rarely present in a case of death by suffocation. They are the less evident as death is the more rapidly induced; for if there be no time for the accumulation of blood in the venous system, there will be no enlargement of the pulmonary vessels, no turgescence of the veins, and no discoloration of the skin. In the cases which occurred in the Champ de Mars in Paris in 1837, of suffocation by pressure in the crowd, when death was probably caused by respiration being incomplete, and was long deferred, the bodies of the dead exhibited peculiar appearances. Their faces and necks were of a uniform violet tint, spotted with blackish ecchymosis, and in some instances blood and froth oozed from the mouth and nostrils.—As in hanging, so in drowning, life is destroyed by different modes, sometimes by suffocation, or rather by the asphyxia which that causes. This is the most usual form of death by drowning. Another form is that of syncopal asphyxia. In these cases, the coldness of the water, or perhaps intoxication, throws the system into a condition of nervous inaction, and the body presents only the appearance of simple asphyxia, paleness of the body, no froth in the trachea or bronchi, and but slight disturbance of the internal organs. Still another cause of death is apoplexy from cerebral congestion. A drowned body usually presents general paleness of the skin, yet the face will be discolored if death was preceded by long-continued struggling. It is to be remarked that upon exposure of the body to the air, discoloration very speedily ensues. The eyes may be found half open, attended by dilatation of the pupils. These signs, as also frothing at the mouth, may proceed from other violent means, but still are strong proof of drowning. Of the internal appearances of the body may be mentioned a fulness in greater or less degree of the blood vessels of the head and of the right side of the heart. The congested condition of the brain varies with the proximate cause of death. If that was apoplexy, it would certainly be present, but rarely or not at all in the case of syncopal asphyxia. The blood of the drowned is generally found fluid. The existence of froth in the bronchi is perhaps not a conclusive proof of the mode of death; but it is certainly the result of vital action, and so may be a valuable sign in conjunction with others to prove that life existed when the body was immersed. The presence of water in the stomach is merely accidental, and is not very nearly connected with the cause

of death. As upon high authority it is asserted that water cannot pass into the stomach after death, its presence in it may be in certain instances significant. When death arises from obstruction of the breath by water, and not by apoplexy, some of the fluid enters the lungs with the last efforts of inspiration. Yet neither the fact that it is found there, nor its quantity, can be regarded as proving conclusively that death took place in consequence of immersion; for under favorable circumstances water may penetrate into the lungs even of a dead body.—Fodéré defines poisons as those substances which are known by physicians to be capable of altering or destroying, in a majority of cases, some or all of the functions necessary to human life. The intent with which such a substance is administered enters of course into the legal conception of a poison. Poisons may be ranked under the two great divisions of irritant and narcotic. To irritant poisons belong the corrosive acids and some of their compounds, the alkalies and their salts, the metallic compounds, and the vegetable, animal, and mechanical irritants. The characteristic of these poisons is the inflammation which their application excites. Their most notable effects upon the human body are heat, irritation, or singular dryness in the œsophagus, accompanied by a sensation of strangling; pain in the stomach and intestines or in the region of the kidneys, followed by stranguary; evacuations both by vomiting and at stool, convulsions, faintings, cold sweats, and an irregular thready pulse. There is usually a retention of the intellectual faculties until the disease approaches a fatal termination. Narcotic poisons, on the other hand, which include many vegetable substances, prussic acid and its compounds, and the narcotic gases, nitrogen, carbonic acid and oxides, oxygen, hydrogen, and others, are distinguished by the disorders which they produce in the nervous system. They are defined by Orfila to be those which cause stupor, drowsiness, paralysis, or apoplexy and convulsions. Among their usual effects, in the various stages of their influence upon the body, may be mentioned numbness, coma, and sometimes delirium, cold and fetid perspiration, swelling of the neck, face, and sometimes of the whole body, dilatation of the veins, protrusion of the eyes, general prostration, chilliness and paralysis of the extremities, and, just preceding death in some instances, pain and convulsions. The narcotic-acrid poisons produce combinations of several of these symptoms. The effects of poisons differ widely in different persons, and are more or less distinctly marked according to the form, whether solid or liquid, in which the poisonous substance is administered. The symptoms are naturally varied too by the condition of the system, particularly of the stomach, when the poison is taken. It may be added here that the effects of poisons may be closely imitated by certain diseases, as for example cholera. Rupture of various intestines,

of the stomach, the duodenum, or the uterus, may produce symptoms similar to those of irritant poisons. In seeking for the evidences of poison in a dead body, the first inquiry is as to the nature of the substance taken. It is a distinctive feature of the irritant poisons that they excite inflammation, in greater or less degree, in every part to which they are applied, and internally corrosions or perforations where the poisonous matter rests longest. The inflammation varies in extent and intensity. It is usually observed in the mouth, throat, and stomach, but may reach through the whole length of the digestive tube. The membranes are of various degrees of redness, sometimes accompanied by dark patches of extravasated blood, and sometimes also by ulceration. The traces of narcotic poisons are not so evident. Dr. Christison says even that the marked appearances which they leave are insignificant. Certainly, it is not characteristic of this class of poisons, as is often supposed, that they induce putrefaction, or that the blood remains fluid. Often, however, the veins of the head are found gorged with blood, the lungs bear black and livid spots, and their texture is less dense. These same changes, both in the brain and in the nature of the blood, are produced by the narcotic-acrid poisons. For the purpose of charging innocent persons with murder, poisons have been in some instances injected after death. Orfila found that he could not reproduce in the dead body the appearances manifested by the living tissues. In the latter case, inflammation in graduated stages of intensity always attends the injury. But in his experiments there was always a perfectly defined line of demarcation between the points to which the poison was applied and those adjacent. In examination of the stomach, it is to be remembered that the vascularity or redness of this organ may arise as well from natural causes as from the influence of poisons. This appearance occurs, says an eminent author, in every variety of degree and character, under every circumstance of previous indisposition, and in situations where the most healthy aspect of the organ might be fairly inferred. Nor are marks of poisons to be confounded with those discolorations which may be produced by the liver and spleen. Ulcers and perforations have sometimes been wrongly attributed to the effects of poison. What is called the self-digestion of the stomach has often been mistaken for poison. In this condition of the organ its coats are rendered thinner and transparent, and sometimes the destruction of them advances even to perforation. These must be distinguished from those which are caused by corrosive poisons. The latter have clearly defined edges, and thick as the thickness of the coats which are pierced. These margins, too, are usually of a peculiar color, according to the poison employed; for example, yellow with nitric acid, brown or black with sulphuric acid and the alkalis, and orange with iodine. Finally, in a case of

spontaneous erosion, there is generally a remarkable whiteness of the inner wall of the stomach; but in a case of poisoning there must be unequivocal signs of inflammation or of irritation.—In reference to the application of chemical tests, it may be remarked that poison may be absorbed or decomposed, and in such cases it may be found by boiling the stomach and intestines, and subjecting the fluid to proper tests. Poisons which remain in the dead body may be affected by the chemical changes involved. By the ammonia disengaged during decay acids may be neutralized; and by the action of the animal matter the mineral salts may be decomposed. Soluble poisons, as oxalic acid, disappear; arsenic, opium, cantharides, and strychnia are not essentially changed. Among the most important of the irritant class, or usually arranged in this class, are arsenic, the salts of mercury, lead, copper, and some other metals; sulphuric, nitric, oxalic, and some other acids. Of the narcotic class may be mentioned opium, prussic acid, strychnia, and the oils of cedar, tanzy, and savin; but some of this class also cause nervous irritation.—Insanity, in all its forms, is an important topic of medical jurisprudence. (See LUNACY.)

MEDICI, a distinguished family of not well authenticated origin, though traced by some genealogists to the days of Charlemagne, and appearing in Florentine history since the close of the 13th century. In 1351 Giovanni de' Medici, at the head of only 100 men, relieved the fortress of Scarperia by forcing his way through a Milanese army then besieging the place. A few years later Salvestro de' Medici acquired great reputation by his firm resistance to the tyranny of the nobles. In 1378 he was chosen chief magistrate, and effected important reforms in the government in spite of the commotions raised against him by the nobility. His son Vieri held also a high rank in the state, and was very popular with the common people. The family were largely engaged in commerce, and accumulated great wealth. The most successful merchant of them all was a second Giovanni de' Medici, who, after serving for many years as a member of the signiory and of the council of ten, was in 1421 twice chosen gonfaloniere, or chief magistrate, the term of the office being then two months. He died in 1429, leaving an immense estate to his two sons, Cosmo and Lorenzo.—Cosmo I., or Cosimo, called the Elder, was born in 1389, and even in the lifetime of his father had been deeply engaged in commerce, and had filled offices of state, having attained to a seat in the signiory in 1416. The death of his father made him the head of the family, and he soon became the leading man in the state. His power and that of his immediate descendants consisted in a tacit influence acquiesced in by the people, and not in any definite authority. The government of the republic continued to be directed by a council of ten and a gonfaloniere;

but the Medici generally either assumed these offices, or nominated their friends and partisans, while paying great deference to popular opinion, and avoiding all ostentation of power. Cosmo, however, was opposed at the outset by a powerful party, headed by the Albizzi family; and in 1433 Rinaldo de' Albizzi carried the elections against him, and procured a decree banishing Cosmo for ten years and his brother Lorenzo for five. At the end of a year the party of the Medici again prevailed, repealed the sentence of banishment, and exiled Rinaldo and his principal adherents. The rest of Cosmo's life was passed in prosperity, and in the promotion of letters and arts and the management of foreign affairs. He continued to the last engaged in commerce, which he carried on through agents. His mercantile transactions seem to have been chiefly with the East through Alexandria. The banking houses which the Medici maintained in the chief cities of Europe were a source of vast profits; and a considerable revenue was drawn from their numerous farms and mines, especially the mines of alum, of which they possessed nearly the monopoly in Italy. Cosmo himself lived in a simple style, but spent vast sums in erecting splendid public edifices. His wealth and influence ranked him with the most powerful princes of Italy, any of whom would have been glad to intermarry with his family; but as such connections might have given rise to unfavorable comments, he selected wives for his sons among the Florentine nobles. Cosmo died Aug. 1, 1464. By a public decree shortly before his death he received the title *pater patriæ*, which was inscribed on his tomb. His son Giovanni died before him.—PIETRO I., his successor, born in 1414, was almost constantly confined to his bed from ill health. He was less popular than his father, and a powerful party, headed by Luca Pitti, the builder of the Pitti palace, and by other prominent nobles, was soon formed against him. Failing to overthrow the Medici by peaceful measures, they attempted in 1466 to assassinate Pietro, but were baffled by his son Lorenzo. The failure of this conspiracy strengthened the Medici, and their principal opponents were banished, with the exception of Pitti, who abandoned his own party and suddenly went over to that of the Medici, who now became the almost undisputed masters of the state. Pietro had conducted with skill and credit several important negotiations during his father's lifetime, and his subsequent direction of the affairs of state was marked by prudence and judgment. He was a munificent patron of letters and arts. He died Dec. 3, 1469, leaving two sons, Lorenzo and Giuliano.—LORENZO, surnamed the Magnificent, was born Jan. 1, 1448. At an early age he displayed extraordinary talent, and the munificent disposition which afterward gave him a claim to the appellation of Magnificent. He had rendered himself conspicuous before he arrived at manhood by his poetical talents, and

by his penetration, courage, and good sense. He was tall and robust, with a dignified countenance and pleasing manners; but his sight was weak, his voice harsh, and he was totally devoid of the sense of smell. He was educated by the first scholars of the age; when his studies were completed he visited the various courts of Italy, and his correspondence with his father during his absence shows that the latter had already learned to repose great confidence in the judgment of his son in political matters. The share taken by Lorenzo in defeating the conspiracy headed by Luca Pitti, and the magnanimity with which he treated the conspirators, extended his reputation throughout Italy. On June 4, 1469, he married Clarice Orsini, of the noble and powerful Roman family of that name. On the day after the death of his father in the same year, Lorenzo was waited upon by many eminent citizens of Florence, who requested that he would take upon himself the administration and care of the republic in the same manner as his father and grandfather had done. In 1471 he was sent to Rome at the head of a splendid embassy to congratulate Sixtus IV. on his elevation to the papacy, and was made treasurer of the holy see. But Sixtus undertook in 1474 the conquest of Città di Castello, on the border of the territory of Florence; and as its ruler Niccolò Vitello was a personal friend of Lorenzo, Florence lent some assistance to its defence, which, though ultimately unsuccessful, was so vigorous and protracted as to cause the pope great expense and vexation, which he attributed chiefly to Lorenzo. He was also incensed by the alliance which Lorenzo effected between Florence, Venice, and Milan, for the purpose of checking the ambitious projects of the pope and protecting the independence of the minor states of Italy. Sixtus thenceforward strove to destroy the power of the Medici, and he is even accused by many historians of having instigated a conspiracy for the assassination of Lorenzo and his brother Giuliano. The attempt was made during divine service in the church of the Reparata, on Sunday, April 26, 1478. The signal agreed upon was the elevation of the host, at which moment Francesco de' Pazzi and another conspirator named Bandini stabbed and instantly killed Giuliano. Two priests at the same instant attacked Lorenzo, but only succeeded in giving him a slight wound in the neck. He defended himself with vigor, and was presently surrounded by his friends, who escorted him home after putting to death all the conspirators present except a few saved by the interposition of Lorenzo himself. Meantime an unsuccessful attempt had been made to seize the government palace by the archbishop of Pisa, who was taken prisoner by the magistrates, and summarily hanged from its windows, together with Francesco and several others of the Pazzi, of which family the only one who escaped the popular fury re-

ceived shelter in the house of Lorenzo. Bandini took refuge in Constantinople; but the sultan ordered him to be sent in chains to Florence, because of the respect which he had for Lorenzo. The pope issued a bull excommunicating Lorenzo and the magistrates, and suspending the entire Florentine clergy, on account of the execution of the archbishop. He also, in conjunction with the king of Naples, made open war upon the republic, offering, however, to conclude peace on condition that Lorenzo should be banished from Florence, or delivered into their hands. As the resources of Florence were inadequate for a long contest with two such powerful enemies, Lorenzo, perceiving that the war was waged against him personally, took the extraordinary resolution of going to Naples, where through his personal influence, in spite of the utmost efforts of the pope, in the course of three months he converted the king from an enemy to a warm friend, and returned to Florence, bringing with him a treaty of alliance with Naples. Peace with the pope soon followed. Lorenzo now began to take measures for securing the peace of Italy by establishing a balance of power in the peninsula, of which Florence was to be the political centre. He also persuaded the people to agree to the institution of a permanent senate, nominated by himself, to govern the republic, instead of the democratic councils to whom the supreme power had been previously intrusted. A second attempt to assassinate him was made in a church in 1481. The assassins were seized before they could execute their purpose, and henceforth Lorenzo surrounded himself with a body guard. Sixtus IV. died in 1484, and was succeeded by Innocent VIII., who was friendly to Lorenzo, and in a short time made him his most intimate confidant, opening to the Medici the dignities and emoluments of the church, by which the family afterward so much profited. The alliance of the pontiff augmented still more the influence of Lorenzo in Italy, which was now in a more prosperous condition than it had been for centuries, while Florence itself had reached the highest pitch of power and opulence to which it ever attained. Lorenzo's attention to public affairs had obliged him to neglect his own, and he became so involved by expenditures for political purposes that in 1490 the republic granted him an allowance to pay his debts, so large that, according to Hallam, she "disgracefully screened the bankruptcy of the Medici by her own." At this time he abandoned commerce, which his family had pursued for so many generations. In the beginning of 1492 he was attacked by a strange species of fever which baffled the skill of the physicians, and of which he died, April 8. He left three sons: Pietro, the eldest; Giovanni, the second, who became a cardinal at the age of 13, and afterward pope as Leo X.; and Giuliano, the youngest, who became duke of Nemours. Lorenzo was eminent not only as a

statesman, but as a poet and scholar. Among his intimate friends were the poets Poliziano and Pulci. He was a munificent patron of authors and artists, and spent vast sums in erecting public edifices and establishing schools and libraries. He reestablished the university of Pisa, and greatly enlarged the famous Laurentian library at Florence, which derives its name from him, and which was founded by his grandfather Cosmo.—The *Opere di Lorenzo de' Medici, detto il Magnifico*, were published under the auspices of Leopold II., grand duke of Tuscany (4 vols., Florence, 1826). See Roscoe, "Life of Lorenzo de' Medici" (2 vols. 4to, London, 1796; best ed. in "Bohn's Standard Library," 1851), and Alfred von Reumont, *Lorenzo de' Medici, il Magnifico, und seine Zeit* (2 vols., Leipsic, 1874).—PIETRO II., his son and successor, born Feb. 15, 1471, had much of the talent without the prudence of his father. His ambition and temerity involved Florence in war with Charles VIII. of France, and led to his own expulsion from the city in 1494, and to the occupation of Florence by the French army shortly afterward. After an exile of ten years, during which he made repeated though futile attempts to regain his authority, he entered the service of France, and perished at the great defeat of the French army by Gonsalvo de Cordova on the banks of the Garigliano, Dec. 29, 1503, being drowned in the river. By his death his second brother, Cardinal Giovanni de' Medici, became the head of the family. In 1512, partly by policy, partly by force, he effected the restoration of the Medici to Florence, and shortly afterward was himself elected pope. (See Leo X.) He intrusted the direction of Florentine affairs to his younger brother GIULIANO, who, having more taste and capacity for literature than for politics, soon resigned his authority into the hands of his nephew Lorenzo, the son of the Pietro who perished in the Garigliano, and retiring to Rome became commander-in-chief of the papal troops. Having married Filiberta of Savoy, of the house of Bourbon, he was made duke of Nemours by Francis I. of France. He died in Florence, March 17, 1516.—GIULIANO left a natural son, IPPOLITO, born in 1511, who was expelled with the whole house of Medici from Florence (1527), on the discomfiture of the holy league formed by Pope Clement VII. against Charles V. He became a cardinal, and his immense revenue enabled him, without territories and without subjects, to maintain at Bologna a court far more splendid than that of any Italian potentate. He was, says Roscoe, "at once the patron, the companion, and the rival of all the poets, the musicians, and the wits of his time. His associates and attendants, all of whom could boast of some peculiar merit or distinction which had entitled them to his notice, generally formed a body of 300 persons." He was poisoned by a domestic, Aug. 3, 1535.—LORENZO II., born Sept. 13, 1492, after the resignation of Giuliano,

governed Florence for some time under the orders of Leo X. He made himself by force of arms duke of Urbino in 1516, and in 1518 married Madeleine de la Tour, of the royal house of France. He died April 28, 1519, a few days after the birth of his famous daughter Catharine de' Medici. Prior to his marriage the duke of Urbino had an illegitimate son named ALESSANDRO, whose mother was an African slave. The paternity of Alessandro has also been attributed to Pope Clement VII., who was himself an illegitimate son of Giuliano, the brother of Lorenzo the Magnificent. It is certain that Alessandro was in high favor with the pontiff, who, on the death of Lorenzo II. without legitimate male heir, and the consequent failure of the descendants of Cosmo the Elder, brought him forward in order to prevent the power of the family from passing into the hands of a collateral branch descended from a brother of Cosmo. He accordingly availed himself of the dissensions of the Florentines, and in 1532, with the assistance of the emperor and the king of France, he compelled the republic to receive Alessandro as its ruler, with the title of duke. He proved, however, to be a licentious tyrant, and was assassinated on Jan. 6, 1537, by Lorenzino, a member of the collateral branch of the family. The citizens assembled on this event, and invested Cosmo de' MEDICI, surnamed the Great, the cousin of Lorenzino, with the sovereignty under the title of chief of the republic, which he afterward exchanged for that of grand duke. He became the progenitor of a line of grand dukes, six in number, who ruled Tuscany till 1737, when the main line of the Medici family became extinct. (See TUSCANY.)

MEDICI, Catharine de'. See CATHARINE DE' MEDICI.

MEDICI, Maria de'. See MARIA DE' MEDICI.

MEDICINE, the science and art of curing disease. Some rude appliances to wounds and injuries, some equally rude observances in cases of internal disease, are common among the most barbarous people. The idea that disease is caused by the anger of superior and invisible beings placed its treatment in the hands of the priests, and the same idea caused that treatment to consist mainly of superstitious rites. In what beyond this consisted the medicine of the Egyptians and the Hindoos is a matter of conjecture only. In Greece as elsewhere the early history of medicine is involved in darkness, and it is idle to guess how much truth is contained in the fables concerning Chiron and his pupil Æsculapius, or the sons of the latter, the Homeric heroes Machaon and Podalirius. We know, however, that the temples of Æsculapius were from an early period the resort of the sick, who submitted themselves to the regulations of the Asclepiadæ, the priests of the temples. It was common among those who were cured to deposit in the temple a votive tablet, on which was inscribed some account of the case and of the remedies by which it

was relieved; but if the tablets which have come down to us are fair samples, but little information could have been communicated in this way. Much more must have been due to the education in the temple, to personal observation, and to the restless and inquiring spirit which animated the early Greeks. But the temples of Æsculapius are not the only source to which the origin of scientific medicine is to be traced; in the schools of philosophy some attention was always paid to the healing art as a branch of general education. When the school of Pythagoras was broken up, and his disciples were dispersed, some of them attended to the practice of medicine; and unlike the Asclepiadæ, who confined their consultations to the temples, the Pythagoreans visited the sick at their residences. Of the extent of their knowledge or the value of their treatment we have no means of forming a judgment. Even at this period it seems that there was still another class, the charlatans, who, without any pretension to education, offered their nostrums for sale in the market place. Besides the temples of Æsculapius and the schools of philosophy, the gymnasias undoubtedly contributed to form the earlier physicians. The gymnasiarchs directed the regimen of those who resorted to the gymnasias; they acquired practical skill in the treatment of the injuries to which their pupils were liable; they set fractures, reduced dislocations, directed frictions, dressings, &c.—In these various ways medicine had already made sensible progress when Hippocrates (born in Cos about 460 B. C.) collected the scattered knowledge of his time, and added to it by his own genius and observation. Of the numerous works ascribed to Hippocrates, enough are decided to be genuine by the unanimous consent of the learned to justify the veneration in which he has always been held as the father of rational medicine. Of anatomy the notions of Hippocrates were crude and limited, and must have been derived solely from the inspection of animals, since the religious prejudices of the ancients prevented the dissection of the human body, until a period long posterior to the one of which we speak. His physiology is on a level with his anatomy. The glands are spongy bodies destined to absorb moisture from the neighboring parts, and the brain, the largest of the glands, draws the vapors from the whole interior of the body. The use of the muscles is to cover the bones, &c. (Renouard, *Histoire de la médecine*.) The body itself is composed of the four elements differently combined in different individuals, and derived from them we have the four humors of the body, blood, phlegm, bile, and black bile, from which again are derived the four temperaments. Disease consists in a disordered condition of the fluids; these are subject to coction, which when complete terminates in a critical evacuation, the localization of the disease, and the formation of a critical abscess, the occurrence of

erysipelas, &c. When coction could not take place the disease was mortal. Crisis was apt to occur on certain days, hence termed critical. He speaks of a principle which he terms nature (*φύσις*), which influences every part of the human frame, superintends all its actions, promotes those that are beneficial, and represses those that are injurious; the great object of the physician was to watch the operation of this principle, to aid or restrain it, rarely to counteract it. He regarded acute diseases alone as the subject of treatment; chronic affections were esteemed beyond the resources of art. The great merit of Hippocrates lies in his descriptions of disease, and the sagacity and fidelity of his observations.—Not long after Hippocrates, Praxagoras of Cos, the last of the Asclepiadæ whose name is mentioned in the history of medicine, probably belonging himself to the family of Hippocrates, observed the relation which exists between the pulse and the general condition of the system. None of his writings have been preserved. Aristotle was the son of a physician, and probably in the earlier part of his life practised medicine; his knowledge of the structure of the body, derived entirely from the dissection of animals, was far in advance of that of his contemporaries; and he laid so widely the foundations of comparative anatomy, that for ages little that was new was added to what he had written. He distinguishes between the nutritive, the sensitive, the motive, and the intellectual faculties. The first is common to plants and animals, to everything which lives and dies; the last is confined to a very few species of animals. The first three faculties reside in every part of the body; the intellect alone has a special seat. Where this is he nowhere expressly says, but it is evident from a variety of passages that he placed it in the heart. He speaks of the greater size of the brain in mankind, says it is composed of two lobes and of the cerebellum, and mentions the ventricles. Of the nervous system he was ignorant, confounding the nerves with the tendons. Of the lungs his account is reasonably correct. The blood vessels as well as the nerves he derives from the heart, which alone contains blood of itself, that of the lungs being contained in the vessels connected with the heart. The blood is the most important of the fluids, and is necessary to life; deprived of it to a slight extent, the animal faints, to a greater dies, while its attenuation and alteration give rise to disease.—Soon after its foundation, Alexandria, under the fostering care of the Ptolemies, became the centre of the science and learning of the time. This was especially the case with regard to medicine; the formation of the Alexandrian library at a time when books were rare and expensive, the personal support of the Ptolemies, the new drugs which commerce brought from distant countries, and above all the authorization of human dissections, gave a great impulse to medical science. But the works of

the Alexandrian school have entirely perished, and we can only judge of them by the reports which are scattered through the writings of Aretæus, Celsus, Pliny, Galen, &c. Of the earlier members of the Alexandrian school, Herophilus and Erasistratus were the most distinguished. The former was familiar with the lacteal vessels and their connection with the mesenteric glands; the muscles were no longer a mere covering for the bones, but their proper office was attributed to them. Erasistratus was acquainted with the functions of the nerves, and is said to have invented the catheter; while Ammonius, another member of the Alexandrian school, invented an instrument for the crushing of stone in the bladder, thus perhaps anticipating an improvement of our own day. With Herophilus and Erasistratus the zeal for anatomy seems to have died out; between them and himself, a period of nearly 500 years, Galen enumerates five or six physicians only who occupied themselves with human dissections.—Until the rise of the Alexandrian school, dogmatism or rationalism, fortified by the authority of Hippocrates, had been the prevailing system. The dogmatists maintained that in order to treat disease we must be acquainted with its occult as well as its exciting causes, and with the natural actions of the body, as concoction, nutrition, &c. To this Philinus of Cos and Serapion of Alexandria replied that the occult causes of the dogmatist depended entirely upon hypothetical opinions; that the minute motions and changes of the internal parts were beyond our observation; that even where the cause of a disease was known, it by no means followed that such knowledge led to a remedy; and that close observation of disease and experience of the effects of remedies in its treatment were the only safe guides to medical practice. The new doctrine, or empiricism as it was termed, long divided medical opinion with dogmatism, though the writings of its advocates have entirely perished, and we are acquainted with their views mainly through the summary given by Celsus. About 150 years after the origin of empiricism, Asclepiades of Bithynia, at first an eminent rhetorician, began to practise medicine at Rome. A philosopher rather than a physician, he was a follower of Epicurus; and on the theories of his master he founded a new medical doctrine which, aided by the popularity of the Epicurean philosophy, as well as by its novelty and simplicity, soon found numerous followers. According to Asclepiades, the human body is permeated in every direction by pores through which at all times atoms varying in form and volume are constantly passing. Health consists in the symmetry between the pores and the atoms which pass through them. Disease is an obstruction of the pores or an irregularity in the distribution of the atoms. This theory was further developed by Themison of Laodicea, a pupil of Asclepiades, who made all diseases

depend upon constriction or relaxation, or upon a third and mixed condition, while all remedies were divided into astringents and relaxants. Asclepiades, it is said, was the first to divide diseases into the two great classes of acute and chronic. While the dogmatists made the fluids the prime seat of disease, and ascribed the origin of all maladies to some alteration in them, the methodists on the other hand thought the solids were first affected, and that the derangement of the humors was but secondary; and the dispute about the humoral pathology and solidism, thus originated, has continued under various forms to our own time.—For 600 years, according to Pliny, Rome had no physicians; not that no attempt was there made to cure diseases, but that these attempts consisted mainly in superstitious observances. Thus, according to Livy, following the advice of the Sibylline books, pestilence was repeatedly stayed at Rome by erecting a temple to Apollo or to Æsculapius, by celebrating public games, or by the dictator driving a nail into the capitol; and Cato the Censor trusted to simples with charms and incantations. When intercourse with Greece became common, Grecian philosophy and science were transplanted to Rome. Asclepiades was the friend of Cicero, and Cæsar when he was taken by the pirates was accompanied by his physician. On attaining supreme power, Cæsar decreed that all physicians at Rome should enjoy the privileges of citizenship. After the names of Asclepiades and Themison, that of Soranus occurs prominently among those practising medicine at Rome; there were probably three physicians of this name, but the most celebrated was a Greek educated at Alexandria and settled at Rome; his writings have perished, unless, as some have supposed, those of Cælius Aurelianus are a translation of them. Cælius is said to have been a native of Numidia, and probably flourished in the 2d century. Of numerous works of which he was the author, that on acute and chronic diseases is alone preserved. It is written in barbarous Latin, but in its description of disease is a great advance on earlier authors. Cælius, like Soranus, belonged to the methodic sect, and is its principal exponent. Of the few Latin medical authors, Celsus is the chief. He appears to have lived in the 1st century, and to have written voluminous treatises on architecture, rhetoric, philosophy, &c., all of which have perished. His book *De Medicina* is a digest of what was known to the ancients on the subject, and shows the great progress which medicine had made in consequence of the labors of the anatomists of Alexandria. Celsus treats of most of the great operations of surgery, of the operations for stone and hernia, of wounds of the intestines, of cataract; he gives directions for the use of the catheter, speaks of the trephine in injuries of the brain, and of the use of the ligature in divided or lacerated blood vessels,

in varices, and in hæmorrhoids. The name of Andromachus, a native of Crete and physician to Nero, has come down to us as the inventor of certain polypharmaceutical compounds, one of which, the theriac, containing the dried flesh of vipers, with 60 other ingredients, was retained in the pharmacopœias of the last century; and he is likewise the first to whom was given the title of archiater. Probably contemporary with Cælius Aurelianus was Aretæus of Cappadocia; we know nothing of him but his birthplace; he has left a treatise on diseases remarkable for accurate and spirited description, and which is one of the most valuable of the medical works of antiquity. Galen (born in Pergamus, A.D. 180), after Hippocrates, has had a far wider share of renown than any other physician; for more than 12 centuries his authority reigned supreme in the schools; even facts were disputed if they were against the authority of Galen. He adopted the Hippocratic theory of the four elements, the four humors, and the four qualities, elaborating and refining upon them at great length and with great subtlety, and making them the groundwork of his doctrines. Besides the solids and the fluids, he assumed a third principle, the spirits, as entering into our composition. These spirits were of three kinds: the natural spirits, derived from the venous blood; the vital spirits, formed in the heart by the action of the air we breathe upon the natural spirits, and which are driven through the arteries; and the animal spirits, formed in the brain from the vital spirits. He also supposed the human soul to be composed of three parts: a vegetative, residing in the liver; an irascible, in the heart; and a rational, having its seat in the brain. The most valuable of the works of Galen are those in which he treats of anatomy and physiology. He appears to have dissected animals only, and he recommends students to visit Alexandria, where they could study from the human skeleton. Considering the narrowness of his resources, his descriptions are wonderfully correct, and they comprehend all that was known of anatomy until the time of Vesalius. Dioscorides, who lived probably in the early part of the 2d century, for many centuries shared the authority of Galen. He has left a work on the materia medica which comprises all that was known to the ancients upon the subject; its arrangement is bad, and the descriptions of the articles so vague that many of them can no longer be recognized with certainty; yet imperfect as it may be, it was for 1,400 years a standard treatise.—From the time of Galen medicine began to participate in the decline which had already overtaken art and literature. Dissections were no longer made; the earlier Christians had as great a horror of profaning the dead body as the pagans, and medical writers, appearing at rare intervals, contented themselves mainly with abridging or copying the works of Galen. Oribasius in the

4th century, Aëtius about 500, Alexander Trallianus in the 6th century, and Paulus Ægineta in the 7th, all wrote in Greek, and were all zealous Galenists. It is but just to observe that Paulus seems to have been fuller than his originals in the description of surgical diseases and operations. It was only when medicine already tended toward its decline that it became legally organized. In the pagan world every one practised at his will, making his way by such qualities as he possessed. The injury done by quackery and imposture led finally to a remedy. Under the Christian emperors every town of a certain size had its archiateri (chief physicians), and no one could practise medicine without having undergone an examination by them. They were paid by the state, and in return were bound to attend the poor gratuitously. In a number of the principal towns medical schools were established, in which the professors and lecturers received a regular salary. The archiateri of the emperors had the title of count or duke, and ranked with the principal officers of state.—Hospitals and dispensaries owe their origin to Christianity; the pagans appear to have had no analogous institutions. The first hospital seems to have been founded at Cæsarea by St. Paula toward the end of the 4th century, and the example was soon followed by the pious, the powerful, and the wealthy.—While the western empire had sunk into barbarism, and the eastern, sadly limited, was struggling for existence, medical science found refuge among the Arabians. Excepting on two points, they contributed little or nothing to its advancement; but Rhazes, Ali Abbas, Avicenna, Albucasis, with the Spanish Saracens Avenzoar and Averroes, were all voluminous writers. Their writings consist mainly of compilations from the Greek authors, chiefly from Galen, whose subtleties and refinements were suited to their genius; yet the "Canon" of Avicenna was for several centuries the received text book in the medical schools of both the Arabians and Europeans; and all the knowledge Europe had of the Greek authors was derived from the translations of the Arabs. In two particulars, as was mentioned, the writings of the Arabians are of high interest: 1. In them we get the earliest clear account of the existence of eruptive fevers; these were divided by them into two forms, *variola* (smallpox) and *morbilli* (the little pests), the latter including measles, scarlet fever, and probably other non-vesicular eruptions. 2. Not only do we derive from the Arabians a number of our milder purgatives, cassia, manna, senna, rhubarb, together with tamarinds, camphor, &c., but in their pursuit of alchemy they produced distilled liquors, some of the metallic salts, and many new pharmaceutic preparations, and laid the foundations of a science which has been of the most essential service to medicine.—As order began to emerge again from

the chaos of barbarism which succeeded the fall of the western Roman empire, monks and priests became the principal physicians, and a little medicine was taught in some of the monasteries; for a long time the Benedictine monks of Monte Casino enjoyed in this respect an extended reputation. From the 9th to the 13th century the Jews, acquiring in their commerce with the Saracens such knowledge as was possessed by the latter, became celebrated as physicians; and as such, despite the laws which forbade them to administer remedies to Christians, obtained access to courts and even to the palace of the Roman pontiffs. One small town affords a glimmer of light during the darkness of this period. The school of Salerno is said to have been founded about the time of the destruction of the Alexandrian library by the Saracens. Toward the end of the 8th century it had attained reputation, and from the 10th to the 13th was at the height of its celebrity. The *Regimen Sanitatis Salerni*, the dietetic precepts of the school of Salerno, composed by John of Milan for the use of Robert duke of Normandy, the son of William the Conqueror, has been frequently republished and commented (translated by Prof. Ordonnau, New York, 1872). The most celebrated member of this school was Constantinus Africanus, who, driven from his native country as a sorcerer, for a time taught at Salerno. His works, which are numerous, are translations from the Arabic, written in barbarous Latin. In the early part of the 13th century Frederick II. published an edict that no one should practise medicine in the kingdom of Naples until he had been examined by the faculty of Salerno. The candidate, after completing his course of studies, was examined on the Therapeutics of Galen, the first book of Avicenna, and the Aphorisms of Hippocrates. He afterward swore to be pure in his life, to be submissive to the laws, to attend the poor gratuitously, and not to share the profits of the apothecary. He then received a diploma, but for the first year was compelled to practise under the superintendence of an older physician.—About the year 1315 Mondino, a professor in the university of Bologna, dissected the bodies of two females; he afterward published an anatomical description of the body, which for the next 300 years was used as a text book in the Italian universities. His merit consists mainly in the boldness of his undertaking, as his anatomy was not much in advance of that of Galen. He did not open the cranium, for fear of committing a mortal sin. Before the year 1500 human dissections were prosecuted at Bologna, Padua, and Pavia. Toward the commencement of the 16th century Du Bois, or Sylvius, as his name was Latinized, used the human body in his demonstrations at Paris as often as it could be procured. Galen was still looked up to as an indisputable authority; and when the results of dissection did not coincide

with his descriptions, they were looked upon as exceptions to the general rule, or as evidence of the degeneracy of the human race. Such was the state of things when, about the year 1543, Vesalius, professor of anatomy in the university of Padua, published his great work on anatomy, in which he pointed out the errors of Galen, and maintained that his descriptions were taken, not from human dissections, but from those of apes. The age was one of anatomical discovery, and Columbus, the successor of Vesalius at Padua, Eustachius at Rome, and Fallopius, confirmed and increased the discoveries of Vesalius. The prejudices against human dissection were mitigated, subjects became comparatively abundant, and printing and engraving served to spread abroad and perpetuate the discoveries that were made.—After the fall of Constantinople, learned Greeks carried a knowledge of their language and literature to the western world. Previous to this date the Greek medical writers had been read only through the medium of faulty Arabic translations; but medical men now availed themselves of this new source of information, and translations of Galen, Hippocrates, Dioscorides, and others were made directly from the Greek. Thomas Linacre, physician to Henry VIII. and to Mary, distinguished himself in this career; he established professorships at Oxford and Cambridge for illustrating the works of Hippocrates and Galen, and laid the foundations of the royal college of physicians at London. Among those distinguished in the same path were Mercuriali, Foës, and J. Fernel; and the attention of physicians as of the learned throughout Christendom was directed to rescuing and illustrating the remains of antiquity rather than to original research.—While medicine was thus recovering the ground it had lost, surgery also was improving. Physicians in the middle ages being invariably priests, whom a canon of the church forbids to shed blood, surgical operations commonly fell into the hands of an inferior and ignorant class of barber surgeons, who frequently were itinerants. Gradually matters improved; the clerical physicians occasionally operated, while the barber surgeons struggled to raise themselves to a higher rank. Gui de Chauliac, a learned priest who published about the year 1363 the earliest modern work on surgery, operated himself; while in the 16th century the great anatomists Vesalius, Fallopius, &c., were likewise distinguished surgeons. But surgery received its greatest impulse from Ambroise Paré, who commenced his career as a barber surgeon. At that period wounds received from firearms were considered poisonous, and it was customary on this account to cauterize their track with boiling oil. In 1536, on one occasion, while serving as surgeon with the French army in Provence, Paré's supply of oil failed him. He could not sleep for anxiety, but in the morning he found that those who had not been cauterized were doing better than those

who had, and this soon led to a revolution in practice. The application of the ligature instead of the actual cautery to restrain hemorrhage after amputations was another of his discoveries.—While the authority of Galen was disputed by the anatomists on matters of fact, his opinions were attacked by a new school of physicians, who were the offshoot of the prevailing study of alchemy. Of this school Paracelsus obtained the greatest notoriety. He publicly burned the works of Galen and Avicenna at Basel, but had nothing to substitute for them but wild and incoherent speculations. Perhaps it was partly owing to the growing spirit of independent observation that we first hear during the 15th century of a number of new diseases. Whooping cough, scurvy, the sweating sickness, and syphilis were now first described. Of scurvy we must believe that the causes which produce it at present must have produced it from all time; and that if it seldom occurred in ancient times, it must have been because of the different modes of living and the short duration of the voyages. With syphilis the case is different; the theory of the American origin of the disease is now shown to be unfounded, and whether it had existed obscurely for a long time, or whether it arose, as some think, from a degeneration of the leprosy so prevalent in the middle ages, its sudden explosion at Naples at the end of the 15th century and its rapid spread throughout Europe are equally unaccountable.—The great anatomists of the 16th century had paved the way for the discovery of the circulation of the blood. Cæsalpinus, in his *Speculum Artis Medicæ Hippocraticum*, had shown a knowledge of the system of the circulation of the blood. Servetus had proclaimed the lesser circulation through the lungs; the valves of the heart, of the aorta, and of the veins were known; it was proved by experiments on living animals that when an artery was tied the blood no longer flowed, and the pulse ceased on the side most distant from the heart; that when a vein was tied it swelled below the ligature, while it became empty on the side toward the heart. And yet the last step was not made. At length William Harvey, after having for about 10 years taught the circulation of the blood in his lectures, in 1628 published his doctrine to the world; and though meeting at first with opposition from some of the older members of the profession, it made rapid progress and was universally adopted during the lifetime of its discoverer. In 1661 Malpighi by the aid of the microscope showed the course of the globules of the blood in the smaller vessels, and 30 years later Leeuwenhoek was able to follow the circulation into the minutest capillaries. The true theory of respiration soon followed the discovery of the circulation. The ancients taught that the minute bronchial tubes inosculated with the pulmonary veins, and that the air thus found its way into the heart. In 1661 Malpighi demonstrated the vesicular substance of the lungs, and about the

same time Borelli and others showed the mechanism by which respiration is accomplished. In 1622 Gaspard Asselli, professor of anatomy at Milan, discovered the lacteal vessels; and about 30 years later Jean Pequet demonstrated the reservoir which bears his name, together with the thoracic duct from its commencement to its termination in the left subclavian. The lymphatic system, the nerves, the brain, and the organs of special sense were all studied with care. In 1747 Haller published his *Prima Linea Physiologia*, and 10 years later his *Elementa Physiologia Corporis Humani*; and from this period physiology had a distinct existence as a science.—In the mean time the materia medica had been enriched by a number of new articles. The chemists had introduced a variety of metallic and alkaline salts, and the new world had yielded guaiacum, sarsaparilla, ipecacuanha, &c.; but two remedies from their importance require a more special notice. On the first appearance of syphilis the surgeons had attacked it by means of mercurial frictions, and with success; but their employment in numerous instances was attended by such terrible consequences, that they gradually fell into disuse. Paracelsus had employed mercury internally, but in the hands of such a practitioner it could rarely be productive of other than mischief; the Galenists condemned its use, and the chemical physicians gave it rarely and secretly. Gradually it again came into favor, and in 1750 Van Swieten, the physician of Maria Theresa, directed all the cases of syphilis in the military and civil hospitals of the Austrian empire to be treated with small doses of corrosive sublimate in solution, and the practice soon became common throughout Europe. The ancients, with whom malarious diseases were common, had no specific means of arresting their attack; even mild intermittents often continued for an indefinite time, and finally induced organic changes and dropsy. In 1639 Peruvian bark is said to have been introduced into Spain by the countess of Cinchon; and though the extravagance of its price, the adulterations it sometimes met with, and its nauseousness were obstacles to its success, its use soon became common throughout Europe.—As chemistry, from vain search after the philosopher's stone or the *elixir vita*, began to assume the aspect of a science, it influenced more markedly the prevailing medical doctrines. Francis de le Boë or Sylvius, a Fleming called to the professorship of practical medicine in 1658, was the first to present a chemical theory of the actions of the animal economy. According to this theory, digestion and nutrition were the consequence of specific fermentations, in which the saliva, the pancreatic juice, and the bile take part. Fevers were produced by other fermentations caused by a vicious bile or lymph. Certain of the humors were naturally acid, others alkaline; in a state of health these were in equilibrium, but disease was consequent upon the predominance of one or the

other. This doctrine, more or less modified, had many followers, and for a time was prevalent both on the continent and in England. Willis and Thomas Sydenham may be ranked among the iatro-chemists; but Sydenham is much the more remarkable for the careful and conscientious manner in which, uninfluenced by theory, he gave himself up to the observation of disease.—While the chemical school was taking form at the north, in Italy the progress of physical science was turning the attention of theoretic physicians in a new direction. Alfonso Borelli, a profound mathematician, was the originator of what has been termed the iatro-mathematical school. In the first part of his work *De Motu Animalium* he applies the received principles of physics to the subject of muscular action, treats of the various attitudes and modes of progression of men and animals, of walking, running, leaping, flying, swimming, and enters into learned and curious calculations of the amount of force which is expended in particular acts. In the second part he treats of the internal movements, of those of the heart, of the blood in the vessels, and of the action of the intestinal canal; the whole body was regarded as a machine, and the laws of mechanics, of hydraulics and hydrostatics, were rigidly applied to it. As an instance of the futile but elaborate calculations into which the mathematical physicians were led, Borelli calculates that the heart at each contraction overcomes a weight of 180,000 lbs. The physiology of the mathematical school had its influence upon their pathology; and the terms derivation, revulsion, lentor, obstruction, resolution, &c., all founded on physical principles, were universally used. The mathematical school had many and eminent followers throughout Europe: in Great Britain, Pitcairn, Freind the historian of medicine, and Mead; in Holland and Germany, Boerhaave and John Bernoulli; in France, Sauvages, the eminent and learned nosologist, and Senac, the physician of Louis XIV. Hermann Boerhaave, professor of medicine at Leyden, had great talent and immense learning, and was an accurate observer and a sagacious practitioner. He was one of the first to devote himself to clinical teaching, and he was fortunate in the devotion of such pupils as Van Swieten and Haller. Unfortunately for his permanent reputation, he lived in an age of transition, and his system, generally received during his lifetime, scarcely survived its author. Jean Senac, another of the mathematical physicians, to whom Morgagni applies the epithet of "great," published a book on diseases of the heart, which has only been rendered obsolete by the introduction of the new methods of auscultation and percussion.—While the chemical and mathematical physicians were reducing the actions of the living body to the laws which govern inert matter, a wholly opposite tendency manifested itself in Germany. Previously indeed Van Helmont, a mystic and alchemist

rather than a physician, in accounting for the vital operations, had introduced what he termed the *archæus*, now a chemical ferment and now an intelligent being, as a controlling power; but his opinions found no followers, and only influenced indirectly the progress of medicine. Georg Ernest Stahl, a great chemist as well as physician, appointed professor of medicine in the university of Halle in 1694, was the author of the new system. According to Stahl, the *anima* (soul) is the great motor and directing principle of the human body. It exercises a recuperative and superintending influence, and guards against injuries, or when they occur takes the best means of repairing them; it is the common source of all motion, of all secretion, of all the vital actions. In showing the insufficiency of the known chemical or physical forces to account for the vital actions, Stahl is happy and ingenious; but in his subtle disquisitions on his own agent, he becomes confused and unintelligible. He has the merit of showing much more clearly than had hitherto been done the influence which the mind exerts over the body. Stahl's opinions, contrary to most theories, exerted a controlling influence over his medical practice, reducing the office of the physician to that of watching and forwarding the operations that nature undertakes for her own relief; while his doctrines, set forth with great logical subtlety, at a time when metaphysical speculations were in vogue, though they found few direct followers, yet had a large influence on the minds of the profession. Friedrich Hoffmann, a fellow professor with Stahl at Halle, was a voluminous writer, whose reputation has extended to our own time. He attributed to the nervous system most of the functions and influences which Stahl ascribed to the *anima*. In speaking of the animal fibre, he ascribes to it a certain natural "tone," which may be increased into "spasm" or diminished to "atony;" and connected with both these hypotheses, while admitting the fluids to be sometimes primarily diseased, in the majority of cases he thought the solids were first affected.—As early as 1752 Boissier de Sauvages of Montpellier published his methodic nosology, in which he endeavors to class and distinguish diseases in the same manner as the vegetable kingdom is classed and described by the botanists. His work was of great use in the advancement of medicine, and remained the standard treatise on the subject until the publication in 1772 of the nosology of Cullen. This author, a professor first in the university of Glasgow and afterward in that of Edinburgh, contributed greatly to raise the latter school to the high rank which it has since enjoyed. His teachings and writings exercised a wide influence, and their effects can still be traced in English medicine in our own day; his descriptions of disease in particular are remarkable for their force and conciseness, but the progress of science has shown the fallacy of the views on which his system was founded. A

contemporary and rival of Cullen, John Brown, a man of genius but of wayward and ill regulated character, was likewise the author of a system which enjoyed a temporary popularity, and which, somewhat modified, found eminent followers in Italy within a recent period.—The end of the last century witnessed the most important practical discovery ever made in medicine. Up to that period smallpox annually committed the most fearful ravages; the deaths from it in Europe alone were estimated to amount to 400,000 a year, while it left many blind or disfigured. The practice of inoculation, brought from Constantinople by Lady Mary Wortley Montagu, had indeed diminished the evil, but the remedy itself was attended with great inconvenience, and was not destitute of danger. The discovery of Jenner, announced in his "Inquiry into the Causes and Effects of the Variolæ Vaccinæ" (London, 1798), has placed the disease completely under our control; and if it still commits occasional ravages, it is owing to the laxity of the laws and the carelessness of individuals. Another great improvement in practical medicine, the use of lemon juice, sour krout, &c., in the dietary of seamen, by which scurvy, which formerly committed fearful havoc on both the naval and mercantile marine, has become almost unknown, is due to the naval surgeons of the last century.—In the present century practical medicine has made greater advances than in any other similar period. This may be attributed: 1, to the brilliant discoveries which have rendered chemistry a new science, by the aid of which we are now able to comprehend much more clearly than before the processes of nutrition, respiration, calorification, secretion, and excretion; 2, to the increased attention paid to microscopy, by which the mode of development of the germ, the organization and growth of the different tissues, the process of repair and that of inflammation, and other morbid processes, have been investigated; 3, to the rapid progress of experimental physiology, aided by chemistry and microscopy; 4, to the increased cultivation of comparative anatomy and physiology; 5, to the cultivation of morbid anatomy not only in relation to the symptoms of disease during life, but to the various degrees of morbid developments, and to the relation which those developments bear to each other; 6, to the new and more perfect methods of investigating disease, by which its diagnosis has become more certain. Under the last head two discoveries are prominent, which have changed the whole face of medicine, giving it a degree of certainty which at one time seemed hopeless: that by Laennec of auscultation and percussion, and that by Bright of the disease of the kidney which bears his name. The development and perfecting of each of these discoveries has employed and is employing the lives and founding the reputation of a vast number of learned, zealous, and able men. 7. The discovery by pharmaceuti-

cal chemists of the active principles of various drugs, has not only rendered those drugs more certain and less nauseous, but has enabled us to exhibit necessary doses which the stomach otherwise would be unable to retain. 8. Not only has the *materia medica* been benefited in the manner above mentioned, but by the discovery of various other remedies, by which diseases hitherto rebellious have been rendered more amenable to the resources of art, and by that of anæsthetics.—**ELECTIC MEDICINE** is a term used to designate a school of medicine whose distinctive doctrines are the selection of whatever may be thought the best practice of other schools, and the employment of "specific medication." These "specifics" are not directed to symptoms merely, but are designed to obviate particular pathological conditions. Thus, a certain class of diseases generate similar morbid products, and remedies calculated to remove these through the various excretory organs are termed by the eclectics specific remedies. Dr. Benjamin Thompson of Concord, N. H., the founder of what was at one time known as the botanic or Thompsonian practice in America, was one of the older members of the school, and also Dr. Wooster Beach, who many years ago founded in New York the "Reformed Medical College," which was soon relinquished. Another was established at Worthington, Ohio, which, at the end of 10 or 12 years was also discontinued, and another at Cincinnati, Ohio, in 1845, under the name of the "Eclectic Medical Institute." This is regarded as the parent school of eclecticism, and has matriculated 5,375 and graduated 1,804 students. The doctrine of specific medication is of recent introduction by Prof. John M. Scudder, the present professor of practice and pathology in the Cincinnati institution.—See "American Eclectic Practice of Medicine," by J. G. Jones, M. D., and William Sherwood, M. D. (Cincinnati, 1857); "Chronic Diseases," by Prof. John King (1867); and "American Dispensatory," by the same (1874). (See **HOMŒOPATHY, HYDROPATHY, MEDICAL ELECTRICITY, and SURGERY.**)

MEDILL, Joseph, an American journalist, born in New Brunswick, near the border of Maine, April 6, 1823. His parents, who were Scotch-Irish, removed to Massillon, O., in 1832, where Joseph passed the next 12 years on his father's farm. He studied and practised law, and in 1849 established the "Republican" at Coshoc-ton, O., as a free-soil whig paper. In 1852 he sold this journal, and founded the "Forest City" in Cleveland, O., advocating the election of Winfield Scott as president, but repudiating the Baltimore platform. In 1853 his paper was merged in the "Leader," and in 1854 he was one of the 12 who formed the republican party in Cleveland: In that year he removed to Chicago, and with John C. Vaughan and Dr. C. H. Ray purchased the "Tribune," with which he has been connected since May, 1855. In 1870 he was elected to the state constitu-

tional convention, and was the author of the minority-representation clause. In 1871 he was a member of the United States civil service commission, which post he resigned on being elected mayor of Chicago. In September, 1873, he resigned the mayoralty and went to Europe. In November, 1874, he returned and purchased a controlling interest in the "Tribune," becoming editor-in-chief.

MEDINA. I. A S. W. county of Texas, bounded N. E. by the Medina river; area, 1,175 sq. m.; pop. in 1870, 2,078, of whom 92 were colored. The surface is rolling and in some parts hilly. Timber and water are scarce. Stock raising is the leading industry. In 1870 there were 42,561 cattle. Capital, Castroville.

II. A N. E. county of Ohio, drained by Black and Rocky rivers; area, 425 sq. m.; pop. in 1870, 20,092. The surface is uneven and the soil fertile. The Atlantic and Great Western railroad passes along the S. border. The chief productions in 1870 were 304,908 bushels of wheat, 393,696 of Indian corn, 587,217 of oats, 148,911 of potatoes, 18,605 of flax seed, 302,702 lbs. of flax, 226,595 of maple sugar, 408,890 of wool, 975,938 of butter, 416,958 of cheese, and 48,619 tons of hay. There were 7,588 horses, 24,329 cattle, 69,742 sheep, and 10,719 swine; 5 manufactories of agricultural implements, 12 of cheese, 1 of lead and zinc, 3 of woollen goods, 19 saw mills, 1 planing mill, and 2 flour mills. Capital, Medina.

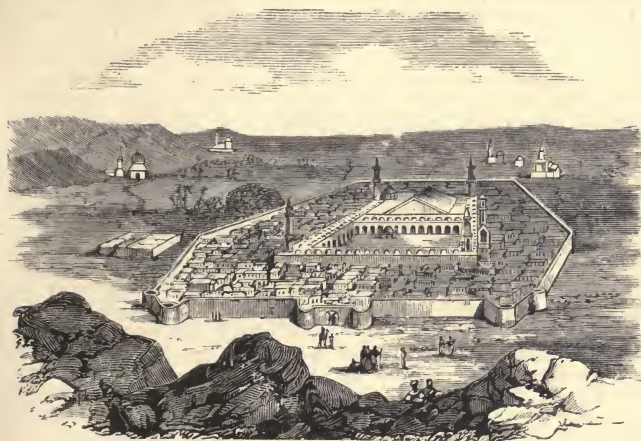
MEDINA (Arab. *Medinet en-Nebi*, "city of the prophet"), a city of Arabia, in the province of Hedjaz, situated on the vast plateau of high land which forms central Arabia, about 250 m. N. of Mecca, in lat. 24° 50' N., lon. 39° 50' E.; pop. about 17,000. It is the second in sanctity of the three holy cities of the Mohammedans. The sacred area is embraced within an imaginary line forming an irregular circle, of which the town is the centre, and of which the diameter is about 12 m. Medina consists of three parts, a town, a fort, and suburbs. The town proper is walled and has four gates. The streets are narrow and dark, and imperfectly paved, and the town has a general appearance of decay. The houses are of brick, basalt, and palm wood; the best of them enclose spacious courtyards and small gardens with wells. The castle joins on to the N. W. angle of the city. The suburbs are S. and W. of the town, and between it and them is the plain of Al-Munakhah. They contain five mosques and the governor's house. The mosque of the prophet is at the eastern extremity of the city. A saying of Mohammed is cited to the effect that one prayer in it is more efficacious than 1,000 in other places, excepting Mecca. The present building, occupying the site of a smaller one existing in the time of Mohammed, is a parallelogram about 420 ft. long by 340 broad. It has a spacious central area open to the sky, surrounded by a peristyle with numerous rows of pillars, surmounted by small domes, and having five gates and five

minarets. In the centre of the court is a piece of ground about 80 ft. square enclosed by a wooden railing, and called the garden of Fatima, the prophet's daughter. Near this enclosure is the well of the prophet. In the covered part of the mosque are the tombs of Mohammed and of the caliphs Abubekr and Omar. They are concealed by a curtain of silk, and have never been seen by a Christian, and the Mohammedan accounts of them are contradictory. At present even Mohammedans are not allowed to see them; the persons in charge declare that whoever should look upon them would be blinded by supernatural light. This mosque has been many times destroyed and rebuilt, the last time in 1710. The town has little commerce, and what trade exists is in grain, cloth, and provisions, and is carried on through the harbor of Yembo, on the Red sea, about 110 m. from Medina. The climate, though hot in summer, is severely cold in win-

vents, two nunneries, ten schools, and hospitals for the sick and for orphans and foundlings. The surrounding country produces excellent fruits. There are brick and pottery works, and manufactories of coarse cloth. Medina Sidonia gives the title of duke to the descendants of Guzman the Good.

MEDITERRANEAN SEA, the great midland sea separating the southern shores of Europe from the north coast of Africa, and bounded E. by part of Asia. It was not known to the ancients by its present name. It is called the Great sea in the Scriptures, "the sea within the columns" by Strabo. By the Romans it was called *mare internum* or *mare nostrum*. The Mediterranean forms a deep gulf which communicates with the Atlantic through the narrow strait of Gibraltar; it is separated from the Red sea by the isthmus of Suez, now pierced by a canal, and penetrates deeply inland through the Adriatic, and still more

so through the Black sea and sea of Azov.—The N. and S. shores of the Mediterranean present a strong contrast; the former is greatly diversified by bays and peninsulas, sinuosities, and islands, while the latter is comparatively uniform. The main body of the sea is divided into two principal basins, each with numerous subdivisions. The western is the smaller, and extends from Gibraltar to the strait between Sicily and the coast of Tunis, the shallowest part of which is called the Adventure bank. The eastern and greater ex-



Medina.

ter, owing to the elevation above the sea. The people are proud and indolent, and live in great part upon the revenues of the mosque, which has estates in almost all parts of the Mohammedan world. Thirty public schools still remain in this once famous seat of learning.—Medina was anciently called Jathrippa, and by the Arabs before Mohammed's time Yathreb. It is the place to which the prophet fled from persecution at Mecca, and where he died. For about 40 years after his death it was the seat of the caliphate.—See Burton's "Personal Narrative of a Pilgrimage to El-Medinah and Mecca" (1856).

MEDINA SIDONIA, a town of Andalusia, Spain, in the province and 22 m. E. S. E. of the city of Cadiz; pop. about 11,000. It stands on a hill in the midst of an extensive plateau, and is laid out in the form of an amphitheatre. The parish church, Santa Maria la Coronada, is a fine Gothic building. There are five con-

tends from this to the coast of Syria. The subdivisions of these basins have received different names. The westernmost, reaching from Gibraltar to the islands of Corsica and Sardinia, is sometimes called the Balearic sea, or sea of Majorca or of Valencia; by some it is divided into the Iberic, Sardic, and Gallic seas, the last including the gulf of Lyons. The body of water between the above named islands and Italy is known as the Tyrrhenian sea, also called the Lignrian, Tuscan, or Italian. The Sicilian sea washes the island of Sicily on the south, and joins the Ionian sea, embraced between south Italy and Greece, and communicating through the strait of Otranto with the Adriatic. On the opposite side the African coast is indented by the gulf of Libya, with the Greater and Lesser Syrtis of the ancients. Between Greece and Asia Minor lies the *Ægean* sea, or Archipelago, the White sea of the Turks, whence the Hellespont or strait of the Darda-

nelles leads into the sea of Marmora (the Propontis of the ancients), which communicates through the Bosphorus or strait of Constantinople with the Black sea or Euxine, the latter in its turn communicating through the strait of Yenikale or Kertch (the Cimmerian Bosphorus of the ancients) with the sea of Azov. The eastern part of the Mediterranean bears among sailors the general name of the Levant; it was formerly subdivided into the Pamphylian, Syrian, and Phœnician seas.—Five large islands and a great number of smaller ones are scattered through the Mediterranean. The former are Corsica, Sardinia, Sicily, Candia or Crete, and Cyprus. They are all mountainous, the summits rising to considerable heights. The principal of the smaller islands are the Baleares with Ivisa and Formentera, the Tuscan islands between Corsica and the Italian mainland, the Lipari or Eolian islands, Malta and its smaller neighbors, the Ionian islands, the Dalmatian islands in the Adriatic, and the islands of the Archipelago (the Cyclades and Sporades of the ancients), the largest of which are Negropont (Eubœa), Rhodes, and Samos. Volcanic phenomena are well developed in southern Italy and Sicily, where Vesuvius and Etna are frequently active; and Stromboli in constant eruption. In the Archipelago the island of Santorin is a partly submerged volcano, occasionally active and forming new islets. (See GRAHAM ISLAND.) Only four rivers of importance empty into the Mediterranean: the Ebro, Rhône, and Po on the N. shore, and the Nile in Egypt. Besides these may be mentioned the Guadalaviar, Tiber, Adige, Maritza, Meander, and Orontes.—The Mediterranean is noted for its bright and deep blue color, when undisturbed, though probably it does not differ much from the ocean in that respect. Prof. Tyndall attributes this tint to minute particles in suspension, the existence of which he proved by optical experiment. Carpenter found by filtration that these particles were inorganic, and much more abundant than in the Atlantic. According to Admiral Smyth, a greenish tinge is prevalent in the Adriatic; it borders on purple in the Levant basin, while the Black sea often has the dark aspect from which it derives its name.—The eastern basin is very deep; S. E. of Candia 1,600 fathoms have been sounded, and in a line from Candia to Malta the greatest depth is about 2,000 fathoms. The alluvium of the Nile forms a submarine promontory in front of the delta. In the Archipelago the islands rise steeply out of deep water, as much as 600 fathoms being found between them. The Adriatic is shallow in its northern part, but in the south has a depression of 500 fathoms. The bottom of the Sicilian sea forms a plateau of less than 500 fathoms, with several shoals. The depth of the Tyrrhenian sea is probably great, though not known in much detail. The Balearic sea reaches 2,000 fathoms in its deepest parts, the bottom rising toward the strait of Gibraltar, which measures a little more than

900 fathoms in its deepest part.—Although the Mediterranean is usually said to be tideless, this is not strictly true; tidal motions are noticed in several localities, though small and irregular, and modified by the force and direction of the wind. The Atlantic tide wave can be directly followed but a short distance along the coast of Spain; on the coasts of France and Italy a small rise and fall occurs, though not regular enough to be formulated in the absence of accurate observations. In the strait of Messina the tidal current, according to Admiral Smyth, runs alternately six hours north and six hours south, though the vertical rise and fall is only a few inches. In the Adriatic the tide is felt sensibly at Venice, but is exceedingly weak in the southern part. On the coast of Africa, Admiral Smyth has observed tides fairly developed in the Lesser Syrtis. A connected study of the tides of the whole basin by means of good instruments, such as modern self-registering tide gauges, is still a desideratum. The local currents of the Mediterranean are partly tidal, and partly due to the winds. At the strait of Gibraltar, however, a strong and constant current runs in from the Atlantic, which cannot be attributed to either of those causes, which merely modify it. This current occupies the middle of the channel, and has a mean velocity of 3 or 4 m. an hour. On either side of it a tidal current is observed, which runs alternately with and against the main current. The true cause of the latter has given rise to much speculation among physicists. That it is due to the evaporation in the Mediterranean being in excess of the river supply has been generally admitted; but this would imply a constant increase of salinity, unless this increase were kept in check. An undercurrent carrying out the denser water had to be almost necessarily admitted, but its actual existence was not proved until the experiments of Prof. Carpenter, in the cruise of the Porcupine, showed it conclusively. This physicist has observed that the water of the Mediterranean contains more salt than that of the Atlantic, that this excess of salinity is greater in bottom water than at the surface, and that in the strait of Gibraltar this denser water flows out into the Atlantic, thus restoring the equilibrium of density between the two seas. Observations in the Hellespont and Bosphorus have shown that a surface current flows out of the Black sea, and an undercurrent in. The relation of densities is here reversed, the Black sea having the least; but the evaporation being less in proportion to the river supply, the current is due less to a restoration of level than to the difference of densities.—The prevailing winds are mostly from the north and west. Some of them are known by specific names, such as the mistral, a cold wind blowing from the Alps along the valley of the Rhône to the sea; its opposite, the sirocco, a scorching hot wind carrying the dry heat of the African deserts over Sicily and all Italy;

and the bora (Boreas of the ancients), a north wind usually accompanied by terrible thunderstorms. These winds, with waterspouts, which are very frequent, especially in the western basin, render the navigation of the Mediterranean rather dangerous during certain seasons. One of the peculiarities of the Mediterranean is the frequent occurrence of remarkable electrical phenomena, known as the St. Elmo's fire, being balls of fire playing in mid air around the masts of ships, and called by the ancients Castor and Pollux.—The diminution of the temperature of the water with the depth follows entirely different rules in the Mediterranean from those found in the open ocean. Dr. Carpenter's observations have shown that the surface temperature, variable according to the seasons, and sometimes reaching 78° in summer, falls gradually to 54° or 55° at a depth of 100 fathoms; below this depth no further diminution is observed down to the greatest depths at which observations were made (1,743 fathoms). This represents the constant temperature of the great body of water occupying the Mediterranean basin, the upper 100 fathoms alone being influenced by the sun's rays. In the ocean the cold influx from the polar regions underlies the warmer strata, and reduces the bottom temperature to about 36° even under the tropics. To this influx a barrier is opposed by the comparatively shallow ridge in the strait of Gibraltar. The uniform temperature of so large a mass of water in a nearly closed basin implies an almost entire absence of circulation and probably of aëration; hence a great scarcity of organized life on the bottom in great depths, in fact an almost entire absence of it when compared with the ocean. (See ATLANTIC OCEAN, and DREDGING, DEEP SEA.) The dredging of the Porcupine showed that, except near the coast, the bottom consists of a tenacious mud, composed of fine yellowish sand mixed with a bluish clay, the proportions varying according to localities. It yielded nothing but fragments of shells and a few *foraminifera*. On the generally rocky bottom nearer shore the dredge brought up richer harvests.—The fauna of the Mediterranean presents a number of northern types whose occurrence has been attributed to a former direct communication between it and the bay of Biscay, which geology shows to have been closed since the eocene period. A few cetaceans and one species of seal inhabit this sea, but are of no commercial importance; the same remark applies to the loggerhead and leather turtles. The tunny, the sardine, and the anchovy among fishes form important articles of trade. Of the lower animals, mollusks, crustacea, and even radiates, all that are possibly eatable are used as articles of food by the inhabitants of southern Europe. The red coral is found in deep water in most parts of this sea, but the principal fisheries are carried on along the coasts of Algeria, Tunis, and Sicily. The pink vari-

ety comes chiefly from that region, while the deep red coral is more prevalent on the east coast of Spain. The finest variety of sponge (the so-called Turkey sponge) is obtained chiefly in the Archipelago and in the Adriatic. In the latter the Austrian government has recently tried its artificial propagation with success.—The shores of the Mediterranean have been the nursery of civilization, the cradle of which was further east. The nations that early established themselves on its borders, particularly on the indented and diversified northern ones, founded there centres sufficiently isolated to foster national feelings, and at the same time near enough to their neighbors for frequent and easy intercourse. Thus commercial relations were early established between Egypt, Phœnicia, Greece, and Rome, carrying with them arts and literature, and developing these very early to a standard which still serves us as a model. The Roman empire brought the entire coast of this sea under its sway, rendering it thus an open channel for the spread of Christianity from the land of its origin toward the west, where it was to receive its highest development. Afterward the Mohammedan religion overspread the eastern and southern shores, and ultimately covered them with comparative darkness, into which the light of modern progress is but slowly beginning to penetrate at a few points.

MEDJIDIEH, a new town of European Turkey, in the Dobrudja, 23 m. W. by N. of Kustendji, on the railway connecting Kustendji with the Danube; pop. about 25,000. Before 1860 the place was only a village; it owes its rapid growth to the immigration of Tartars from Russia. Some hundreds of them came to Kustendji after the Crimean war. They were employed upon the railway then in process of construction, and afterward, by the care of the English engineers, received free transportation to Medjidieh. The geographical advantages of the place soon attracted a large immigration, and in 1862 there were living in the town and its vicinity from 40,000 to 50,000 Tartars, greatly outnumbering the Turkish population, and distinguished for the number and excellence of their cattle, while they also raised great quantities of wheat for export. Medjidieh, named after the sultan Abdul Medjid, became the Tartar metropolis of the province.

MEDLAR, a fruit-bearing tree of the order *rosacea*, common in the wild state in most parts of Europe, some of the finer varieties of which are cultivated. In most works the medlar is placed in a separate genus as *mespilus Germanica*, but Hooker and Bentham in their new *Genera Plantarum* unite it with *pyrus*, from which it only differs botanically in having hard and bony carpels to the fruit. The medlar is a large shrub or small tree, usually with very crooked branches, simple leaves, and flowers resembling those of the pear; the fruit in the cultivated kinds is about 1½ in. in diameter and broader than long; at

the top of the fruit is a broad hairy disk, surrounded by the calyx lobes, which remain green and leafy until the fruit is nearly mature; when ripe the skin of the fruit is brown, and the flesh firm and austere; the fruit is only eatable after having been kept until the first stage of decay, called bletting, has thoroughly softened the flesh to a pulp; in this state the medlar is highly prized by some, who are fond of its rich subacid flavor, but it is not regarded as a popular fruit. Of the varieties, that called the large Dutch is preferred; the trees are propagated by grafting upon seedling medlars or upon the pear and thorn. The plant has been used for hedges, and it is sometimes set as an ornamental tree where the effect of rusticity is desired. It is very seldom cultivated in this country.—The Japan medlar (*Eriobotrya Japonica* of most authors, but by Hooker and Benthham reduced to *Photinia*), also known by the Chinese name of loquat, is a favorite ornamental tree in our warmer states. It is largely cultivated in Japan and China, and was



Medlar.

introduced into Europe nearly a century ago. In its native country it forms a large tree; its large evergreen leaves are rough, bright green above, and downy beneath; the flowers, produced in autumn, are in large terminal spikes, and pleasantly fragrant; the fruit, which ripens the following spring, is of the size of a small apple, oval, pale orange with a blush of red, and an orange-colored subacid pulp resembling an apple in flavor. The tree does not produce fruit in the north of Georgia, but has done so in Louisiana; wherever it will endure the winter, it is a valuable tree both on account of its handsome foliage and its late season of blooming.

MÉDOC. See FRANCE, WINES OF.

MEDUSA, in mythology. See GORGONS.

MEDUSA, in zoölogy. See JELLY FISH.

MEDWAY (anc. *Vaga*), a river of England, which rises in the S. E. part of Surrey, traverses Kent, flowing mainly E. and N., and falls into the estuary of the Thames at Sheerness near its mouth. It is about 60 m. long, and navigable to Penshurst, 40 m. In its lower course it expands into a broad, deep tidal inlet,

and a little above its embouchure it sends off a navigable branch on the right called the East Swale, which cuts off from the mainland the isle of Sheppey. The Medway is one of the most important havens for the British navy, and on its banks are two large government dockyards, Sheerness and Chatham. Ships of the line can anchor in the channel as far up as Maidstone.

MEEK, Alexander Beaufort, an American author, born in Columbia, S. C., July 17, 1814, died in Columbus, Miss., Nov. 30, 1865. He graduated at the university of Alabama, was admitted to the bar in 1835, and in the same year became editor of a newspaper at Tuscaloosa. He served as a lieutenant of volunteers against the Seminoles in 1836, and at the close of the campaign was appointed attorney general of the state, but soon resigned this post and resumed his practice. He was judge of the county court from 1842 to 1844, during which time he prepared a supplement to Aiken's "Digest of Alabama." From 1848 to 1852 he was associate editor of the "Mobile Register." He was elected to the legislature in 1853, and secured the establishment of a free school system in the state. He was a presidential elector on the democratic ticket in 1856, was again elected to the legislature in 1859, and was chosen speaker of the house. He published "Romantic Passages in Southwestern History," and "Songs and Poems of the South" (New York, 1857), and left an unfinished "History of Alabama."

MEEKER, a S. central county of Minnesota, watered by Crow river, and containing numerous small lakes; area, 558 sq. m.; pop. in 1870, 6,090. The surface is rolling, consisting mostly of fertile prairies. It is traversed by the St. Paul and Pacific railroad. The chief productions in 1870 were 135,147 bushels of wheat, 28,974 of Indian corn, 92,532 of oats, 10,492 of barley, 39,913 of potatoes, 142,771 lbs. of butter, and 15,329 tons of hay. There were 963 horses, 1,871 milch cows, 3,837 other cattle, 2,936 sheep, and 2,687 swine; 4 flour mills, and 4 saw mills. Capital, Litchfield.

MEERANE, a town of Saxony, in the circle and 9 m. N. by W. of the city of Zwickau; pop. in 1871, 19,187. In 1858 the population was 11,147. The increase is due to the progress in the production of woollen and semi-woollen goods. The town contains upward of 100 manufactories of such goods, the exports of which are valued at about 15,000,000 thalers annually. Plush, dyestuffs, and other articles are also made here. It once belonged to Bohemia, and became part of Saxony in 1779.

MEERSCHAUM (Ger., sea foam, so called from its lightness and whitish appearance), or **Magnesite**, a hydrous silicate of magnesia, of composition represented by the formula $MgO, SiO_2 + 2H_2O$. It is a mineral of soft earthy texture somewhat resembling chalk, of hardness 2.5, and of variable specific gravity. It is found in Spain and several countries at the

head of the Mediterranean, occurring in the form of veins in serpentine, and also in tertiary deposits. Dr. J. Lawrence Smith found it in Asia Minor in alluvium, apparently the result of the decomposition of carbonate of magnesia belonging to neighboring serpentine rocks. It is largely collected there for the manufacture of pipes and cigar tubes, the town of Konieh furnishing the principal supplies. It is roughly shaped into blocks, or sometimes into rude forms of pipes, for exportation, and freed as far as practicable from the associated minerals, which impair its quality by interfering with the carving and smoothing of its surface. It is fashioned into finished pipes, which are often highly ornamented, in different cities of Europe. Pesth and Vienna are famous for this manufacture. To produce the yellow and brown colors, which are much admired in the pipes, and which are brought out only after long smoking, the blocks are kept for some time in a mixture of wax and fatty matters. A portion of these is absorbed, and, being subsequently acted upon by the heat and the tobacco fumes, assumes various shades of color. The lightest qualities are too porous for producing the best pipes; and the heaviest are rejected from suspicion of their being artificial products. These artificial preparations are from the parings of the genuine material, which, being reduced to fine powder, are boiled in water and moulded into blocks, sometimes with the addition of clay. After drying and contracting, they are ready for carving. This kind is known by the name of *Massaköpfe* or *massa bowls*. The artificial meerschams cannot easily be distinguished from the real; but they are generally heavier, and are more free from blemishes, some of which, arising from the presence of foreign minerals, are often seen in the genuine meerschams.

MEERUT. I. A district of British India, in the Northwest Provinces, forming part of the Doab, and bounded E. by the Ganges and W. by the Jumna; area, 2,332 sq. m.; pop. in 1871, 1,271,454, of whom about 900,000 were Hindoos. A ridge of low hills traverses the district from N. to S., separating the valleys of the Ganges and Jumna, but the surface is generally remarkably level. The soil is abundantly watered by the Ganges and Jumna, and by the Ganges canal, about 50 m. of which lies in the district. The vegetation of the tropics alternates here with that of more northern latitudes, wheat being cultivated in the cool season, and sugar cane, indigo, and cotton in the wet. Apples, peaches, mangoes, and strawberries abound. The climate is one of the finest in India. **II.** A city, capital of the district, on the river Kallee Nuddee, nearly equidistant from the Ganges and the Jumna, 820 m. N. W. of Calcutta, and 40 m. N. E. of Delhi; pop. about 30,000. The streets are narrow and dirty, and the native part of the town is wretchedly built, though it contains some ruined mosques and pagodas of considerable

architectural interest. It is an important military station, having an extensive cantonment about 2 m. distant. The English church, which is capable of holding 3,000 people, is one of the finest in India. In the beginning of the sepoy rebellion, one of the most serious outbreaks occurred at Meerut. The town contained at that time about 4,500 troops, nearly half of whom were Europeans. The native soldiers showed insubordination as early as April, 1857; and on May 9, 85 troopers were imprisoned for refusing to receive the new cartridges. On the next day, Sunday, the comrades of these men and the sepoys of the 20th native infantry rushed from their lines on a given signal and proceeded to the quarters of the 11th native infantry, whose colonel fell riddled with balls while endeavoring to persuade them to return to duty. The 11th now joined the rebels, the imprisoned troopers were released, 1,200 ruffians were let loose from the jail, and the mutineers and the rabble set fire to the cantonment and murdered every European who fell in their way. The English troops were badly managed, and the rebels escaped them and marched to Delhi.

MEGALONYX (Gr. μέγας, μέγαν, great, and ονυξ, claw), an extinct genus of giant édentates, allied to the sloths, established in 1797 by Thomas Jefferson, in a communication to the American philosophical society of Philadelphia, in whose "Transactions" the bones were described by Dr. Caspar Wistar, who first suggested the affinity of the animal to the recent sloths. The first bones were discovered in a limestone cavern in western Virginia, and were referred by Mr. Jefferson, from the large size of the claws, to some carnivorous animal; the original specimens of this, the *M. Jeffersonii* (Harlan), are in the cabinet of the academy of natural sciences at Philadelphia. These, and other bones found in Tennessee, Kentucky, Mississippi, and Alabama, form the materials of the most complete monograph on the subject, that of Prof. Joseph Leidy, in vol. vii. of the "Smithsonian Contributions to Knowledge" (1855). The skull is about 14 in. long, with the upper outline nearly horizontal, depressed forehead, and convex nose; the sagittal crest prominent and rugged; zygomatic process strong, and temporal fossa rough for the attachment of muscular fibres; the mastoid process strongly marked; the orbital cavity shallow; the hard palate between the three posterior molars 14 lines wide, with a median convexity nearly as prominent as the teeth, becoming almost plane in advance of the third molars, and varying in width from 2½ to 4 in., perforated by large foramina and by a large incisive foramen between the first molars; the occipital foramen circular, 16 lines in diameter, the surface of the foramen bone being rough for the attachment of powerful muscles; orifice of nose irregularly circular, about 3 in. in diameter; lower jaw about 13 in. long. The teeth are long, without fangs, sub-elliptical, of nearly uni-

form diameter, with the crown hollowed in the middle, and projecting border; as in other edentates, they are deeply excavated from the bottom for the persistent dental pulp; they have no enamel, being composed of very porous dentine in the centre, surrounded by a harder layer of the same which is enclosed by a thinner crust of cementum; the formula is $\frac{4}{2}-\frac{4}{2}$, the anterior tooth being considerably in advance of the others, in form and position like a canine; they vary in diameter from 8 lines to an inch; the rami of the lower jaw are widely separated, and the symphysis narrow. The bones of the skeleton are strong, though less so than in the allied megatherium; the scapula is about 1½ ft. long, the humerus 20 in.; the thigh bones are relatively shorter and broader than in the sloths and about 21 in. long; the tibia relatively very much shorter than in the sloths, but of greater relative length than in the mylodon; the shaft of the humerus suddenly expands toward the lower extremity, and is pierced by a large foramen; the astragalus like that of recent sloths, 5½ by 3½ in.; the heel bone developed in an extraordinary manner, being long, compressed, and high; the phalanges large and narrow, and armed with powerful claws; the tibia and fibula distinct, and the foot articulated obliquely, the last leading Mr. Lund to the opinion that the animal was a climber; the anterior limbs a little longer than the posterior; the tail strong and solid. From the study of the toes Cuvier pronounced the animal an edentate; the well marked ridge in the middle of the articulating surface of the last phalanx indicates a more restricted motion than in carnivora, to which Mr. Jefferson referred it; the upper edge extends further back than the lower, preventing the claws from being raised above a horizontal line, but permitting complete flexion below, as in sloths; their form and proportions are also those of edentates; the middle and third fingers are large, with very strong claws, the index being smaller with a less strong claw, and the thumb and little finger rudimentary. This animal was less heavy in form than the megatherium, which it doubtless resembled in its habits; it was probably of the size of a large ox. The bones are found in the pleistocene or drift formations of America, contemporaneous with the elephant and mastodon, and perhaps surviving them; bones of another species are found in Brazil. (See MEGATHERIUM.)

MEGALOPOLIS, a city of ancient Greece, originally capital of the Arcadian confederation, on the river Helisson. It was founded at the suggestion of Epaminondas, after the battle of Leuctra (371 B. C.), and was designed by him as a check to Sparta. Forty townships furnished inhabitants for the new city, which was 6 m. in circumference, and had a larger domain allotted to it than that possessed by any Arcadian state. But it never attained the importance anticipated for it, and was too large for its population, that of its entire territory

being but 65,000. Apprehension of Sparta afterward drove the Megalopolitans into alliance with the Macedonians, and held them aloof from the coalition formed in Greece on the death of Alexander for the recovery of independence. They at length fell under the dominion of tyrants, the last of whom, Lydiades, resigned in 234, and united Megalopolis to the Achaean league. In 222 Cleomenes III., king of Sparta, captured it by surprise, and destroyed the greater part of it; but after his defeat at the battle of Sellasia (221) the Megalopolitans who had fled returned under the conduct of Philopœmen, and rebuilt the city on the original scale; but it never regained its former prosperity, and rapidly sank into insignificance. It contained no acropolis, owing to its flat situation, but a magnificent agora, colossal statues, and famous temples. Little remains of this great city, which used to be called the great desert, owing to its magnificent distances, excepting the well preserved ruins of the theatre, which Pausanias regarded as the largest in Greece; and they are still visible amid the thickets and corn fields which cover the site of the city near the village of Sinano.

MEGALOSAURUS (Gr. μέγας, great, and σαῦρος, lizard), a gigantic fossil reptile of the family of dinosaurians, which includes the iguanodon, previously described. This family, entirely extinct, was remarkable for great size and for certain mammalian characters; the long bones have a medullary cavity, the feet are short and pachyderm-like, the sacrum composed of at least five anchylosed vertebræ, the ribs doubly articulated to the spine, the vertebral laminae greatly developed, and the lower jaw capable of a horizontal triturating motion; but the



Megalosaurus (restored).

teeth, scapular arch, and most of the skeleton resemble those of lizards. The genus *megalosaurus* (Buckland) was discovered by Dr. Buckland in the Stonesfield oolite near Oxford, Eng.; remains have also been found in the Wealden and Jurassic formations. The *M. Bucklandi*

(Cuv.), the best known species, had probably a straight muzzle, thin, and laterally compressed; the teeth were flat, pointed, curved backward like a pruning knife, with the enamel of the posterior edge serrated to the base, and for a short distance from the point also on the anterior; the structure of these teeth, calculated to lacerate flesh and to hold a prey once seized, shows that the animal was highly carnivorous. The teeth, some of them 3 in. long, were implanted in distinct sockets formed by partitions running across from the higher external to the lower internal border of the jaw, combining crocodilian and lizard characters. This animal must have attained a length of 30 or 40 ft.; it was terrestrial, and probably preyed upon the smaller reptiles and the young of the larger.—The *hylaosaurus* (Mantell), another dinosaurian reptile, is described under its own head.

MEGANTIC, a S. E. county of Quebec, Canada, watered by the Bécancour river; area, 743 sq. m.; pop. in 1871, 18,879, of whom 12,074 were of French, 4,444 of Irish, 1,302 of Scotch, and 963 of English origin or descent. It contains Lakes Joseph and William, and is traversed by the Grand Trunk railway. Capital, Leeds.

MEGARA, a city of ancient Greece, capital of Megaris, about 1 m. from the Saronic gulf, opposite the island of Salamis, 20 m. W. by N. of Athens. It consisted of a double acropolis and the city proper. The more ancient acropolis is said to have been built by Car, son of Phoroneus; the other, together with the city, by Alcathous, son of Pelops. Subsequently a Dorian colony, under Alethes and Athemenes, took possession of the city, and enlarged it. Its original name appears to have been Polichne. In the 8th and 7th centuries B. C. Megara was opulent and powerful, and founded the colonies of Megara Hyblæa in Sicily, Astacus in Bithynia, and Chalcedon and Byzantium on the Bosphorus. In the time of Solon it entered into a contest with Athens for the island of Salamis, but without success. In the Persian war it contributed 3,000 heavy-armed troops and 20 ships to the confederate forces. After that struggle Megara left the Peloponnesian confederacy for that of Athens, to which ere long it became virtually subject; and the Athenians, to secure their supremacy over it, built the long walls which connected Megara with its port Nisæa. The Athenian garrison, however, was expelled by the aid of Peloponnesian troops in 445. The Athenians retaliated by excluding the Megarians from their markets and harbors, which decree operated so injuriously to the interests of the latter that its enforcement was one of the pretexts of the Spartans and their allies for the Peloponnesian war. During that war Megara suffered severely from siege and famine, the Athenians being still in possession of Nisæa; and subsequently, though it partly recovered its prosperity, it ceased to be prominent in history. It was celebrated for its philosophical school, founded by Euclid, the disciple of

Socrates. It contained noted public buildings, of which few traces remain. The present little town of Megara, which is the capital of the nomarchy of Attica and Bœotia, is dilapidated. A ferry connects it with Salamis.

MEGARIS, a district of ancient Greece, bounded N. by Bœotia, E. by Attica, S. by the Saronic gulf, and W. by Corinth and the Corinthian gulf; area, about 143 sq. m. It is in general rugged and hilly. The principal mountains are Mt. Cithæron, which separates it from Bœotia, and the Geranean chain, which extends E. and W. across its S. part from sea to sea. Through this chain are three passes: one, the Scironian pass, runs by the Saronic gulf, and formed the direct road from Corinth to Athens; another, which runs along the Corinthian gulf, was the great thoroughfare between Bœotia and the Peloponnesus; and a third crosses the centre of the mountains. The territory of Megaris contains no plain except that of its metropolis. The earliest inhabitants were Æolians and Ionians, and it originally constituted part of Attica. The present eparchy of Megaris (pop. about 12,000) forms part of the nomarchy of Attica and Bœotia.

MEGASTHENES (Gr. μέγας, great, and σθένος, strength), a name given by Dana to one of the grand divisions of the non-marsupial or higher mammals, as indicating a superior type, based on a larger and more powerful plan of structure. This division includes the monkeys, carnivora, herbivora, and cetaceans. He has given the name of *microsthenes* (μικρός, small, and σθένος, strength) to the inferior, based on a weak type of structure; this division includes the bats, insectivora, rodents, and edentates. The marsupials and monotremes constitute the still lower division of semi-oviparans or oötocoids; and man forms alone the highest or fourth division, the archonts. The parallelism between the megasthenes and microsthenes is, according to him, complete; the bats in the latter represent the monkeys in the former; the insectivora represent the carnivora, the rodents the herbivora, and the edentates the cetaceans.

MEGATHERIUM (Gr. μέγας, great, and θηρίον, animal), an extinct edentate animal, of gigantic size, coming in many respects near to the sloth family, and with its allies, the megalonyx and mylodon, seeming to form the transition from the edentates to the proboscidiens. Pictet calls the family gravigrades, placing them between the sloths and the armadillos; in all the molars are hollow cylinders of dentine and cement without enamel, the tube of dentine being filled with a porous substance; the form of the head, which is short and truncated, the large descending zygomatic process, and many parts of the skeleton (as the union of the acromion and coracoid processes of the scapula), resemble those of the sloths; the teeth consist only of molars, the canines of the sloths being absent; in their heavy forms, nearly equal limbs, and long and strong tail, they

come nearer the armadillos and ant-eaters. The genus *megatherium* (Cuv.) is the first described of the family, the first skeleton having been sent in 1789 from the vicinity of Buenos Ayres to Madrid, where it now remains; since then other skeletons and frag-



Megatherium (restored).

ments have been discovered in Peru, Paraguay, and other parts of South America; another species is described by Dr. Leidy in North America. This genus is distinguished from the other megatherioids by the quadrangular prismatic form of the teeth and the marked transverse ridge on the crown; the dental formula is $\frac{5-5}{4-4}$; the anterior limbs have four fingers, the posterior only three, the two outer being without nails, the others with large claws. The well known South American species, *M. Cuvieri* (Desm.), is intermediate in size between



Megatherium (skeleton).

the elephant and the rhinoceros; the skull is relatively longer than in sloths, and the large foramina for the passage of nerves and vessels indicate that the animal had very thick lips; the teeth, from 7 to 9 in. long, are implanted deeply in firm alveoli, and the ridges of the

upper fit into the depressions of the lower; the lower jaw is large and heavy; the vertebrae are 7 cervical, 16 dorsal, 3 lumbar, 5 sacral, and 15 caudal, of medium size in the anterior portions of the body; those of the tail are enormous, the largest measuring 18 in. from one end of the transverse process to the other; the V-shaped bones are also greatly developed, the tail serving as a means of support and perhaps of defence; the ribs are short and thick, and roughened for muscular attachments. The anterior limbs are remarkable for the strength of the shoulder, the clavicle being massive and curved like the letter S, and the acromion and coracoid processes united; the humerus is much enlarged at the lower portion to support a wide ulna and a radius freely turning around it, as in the monkeys and sloths; the large processes indicate immense force of rotation; the fore feet were strong, and armed with powerful claws. The pelvis is very large and solid, measuring 4½ ft. from hip to hip, considerably more than in the largest elephant; the cotyloid cavity is directed downward, so that the thigh bones support the body without obliquity, securing great strength and solidity at the expense of rapidity of motion; the thigh bones are at least three times as thick as in the largest elephants, and the length is only double the width; the tibia and fibula are very thick, and united at the top; the heel bone is almost as long as all the rest of the foot, and the nail of the middle toe enormous. These details suffice to show that the megatherium was very large and powerful; the entire fore foot being about a yard long and the claws set on obliquely to the ground, it may be inferred that the anterior limbs were principally used for digging; the great size of the pelvis and hind legs, and strength of the tail, were necessary to sustain so heavy an animal in an upright position while using its fore feet in digging around the trees which it afterward prostrated by the weight of its body. The teeth show that it was herbivorous, feeding on the stems and roots of trees and succulent fruits. Their size and structure indicate that they did not burrow under ground like the mole, nor climb trees like the sloth, nor dig up roots or ant hills like the armadillos and ant-eaters, but loosened and cut the roots of trees with their powerful claws, and then, supported on the hind limbs and tail, pulled them down with the fore limbs aided by the great weight of the body. Like the living sloths, this species was limited in geographical distribution to South America, in the alluvial deposits of which, on the pampas, their bones have principally been found. Dr. Leidy, in vol. vii. of the "Smithsonian Contributions to Knowledge" (1855), describes a North American megatherium (*M. mirabile*, Leidy), discovered in the maritime portion of Georgia and on the shores of Ashley river, South Carolina, in connection with bones of the elephant, mastodon, horse, and ox; it is now preserved in Washington and Philadel-

phia. (See MYLON for comparative measurement and other interesting points.)

MEGERLE, Ulrich von. See ABRAHAM à SANTA CLARA.

MEHÁDIA (anc. *Therma Herculis*), a small town of Hungary, in the Banat, 6 m. W. of the Roumanian frontier, and 12 m. N. of Orsova; pop. about 1,800. It is finely situated, and has been celebrated as a watering place since the times of the Romans. The springs are sulphurous, and are very beneficial in gout and other diseases. There is accommodation for 1,000 visitors. The season begins in June.

MEHEMET ALI, or **Mohammed Ali**, pasha of Egypt, born at Kavala, Macedonia, in 1769, died in Cairo, Aug. 2, 1849. He lost his father at an early age, and was brought up by the governor of the town. Soon after reaching manhood he was made a collector of taxes, and *buluk bashi*, or commander of a body of infantry, and received a rich relation of the governor in marriage. He next became a tobacco merchant, and had acquired considerable property when in 1799 he was sent to Egypt as second in command of the contingent of 300 men furnished by his native place to the Turkish army, despatched to carry on the war against the French expedition commanded by Bonaparte. Soon after his arrival he succeeded to the principal command of his corps, with the rank of *him bashi* or commander of 1,000 men. His ability attracted the notice of the pasha and of the soldiers, and he soon became one of the most distinguished and popular military chiefs in Egypt. After the expulsion of the French a civil war broke out between the Turks and the Mamelukes, in which Mehemet Ali took an active part. The Albanians in the service of the pasha revolted because they could not get their pay, and after several conflicts in Cairo they became masters of the city, under the direction of Mehemet Ali. A long and confused struggle now ensued between various factions, the result of which was that in May, 1805, Mehemet Ali was invested with the supreme authority by the principal inhabitants of Cairo, as the only man capable of restoring order; and shortly afterward his elevation was confirmed and made legal by a firman from the sultan. But although he possessed the title of pasha of Egypt, his authority did not actually extend beyond the walls of Cairo, as everywhere in the country the Mameluke beys were still in rebellion. Some time afterward a considerable body of the beys, who with their followers had encamped not far from Cairo, were enticed into making an attempt to seize upon the city. They forced an entrance by a gate purposely left undefended, and marched triumphantly through the streets until they were suddenly surrounded by the troops of the pasha, who slaughtered them without mercy, a few only breaking through and escaping. The rest of the Mamelukes fled to Upper Egypt, whither Mehemet Ali pursued them with a considerable force. He had

defeated them near Sioot when the arrival of a British expedition at Alexandria, March 17, 1807, consisting of 5,000 men under Gen. Fraser, led him to conclude a truce with the beys, and to promise to comply with all their demands if they would cooperate against the invaders. Most of them agreed to his proposals, and were marching against the British, when Gen. Fraser, who had been already several times defeated by the pasha's troops and had lost about 1,000 men, retreated and left the country, Sept. 14. Many of the beys now took up their abode in Cairo, and for three or four years Egypt was comparatively tranquil, notwithstanding occasional battles between the Mamelukes and the pasha's troops, in one of which the latter was signally beaten. At length, on March 1, 1811, Mehemet Ali enticed all the Mamelukes in Cairo into the citadel on pretence of witnessing the ceremony of investing his son Tusun with the command of an army to be sent against the Wahabees in Arabia. The gates of the fortress were then closed upon them, and they were killed to the number of 470. Immediately afterward the pasha's officers and soldiers throughout Egypt massacred all the Mamelukes within their reach. The few who escaped fled to Nubia, where they dwindled away till the corps became extinct. These energetic proceedings established the power of Mehemet Ali, and gave to Egypt an internal tranquillity unknown for ages, and which has lasted to the present time. Tusun Pasha was now sent with 8,000 men against the Wahabees, from whom he recaptured the sacred cities of Mecca and Medina, and whose leader he took prisoner. He subsequently met with disasters, and in 1813 Mehemet himself went to Arabia to conduct the war. He was successful, and in 1815 returned to Egypt after concluding a treaty with the Wahabee chiefs. He now made an attempt to introduce European discipline into his army; but a formidable mutiny breaking out in consequence, he temporarily abandoned his design. The Wahabees not having fulfilled the conditions of the late treaty, he sent his son Ibrahim against them in 1816, with an army composed in part of the recent mutineers. The expedition succeeded in capturing El-Derayah, the Wahabee capital (1818), and in suppressing all armed opposition in Arabia to the sultan's power. Mehemet Ali now turned his attention to the improvement of manufactures in Egypt, and to the revival of the commerce of the country. He also caused the construction, at an enormous sacrifice of the laborers from sickness and want, of a great canal from Alexandria to the Nile. In 1820 his youngest son Ismail was sent with an army to conquer Sennaar, and to collect captives to be sent to Cairo with the view of forming them into an army in the European manner. Sennaar, Dongola, and Kordofan were subdued; and although in 1822 Ismail was surprised and with his retinue burned alive by a native chieftain, these prov-

inces have since remained subject to Egypt. The captives taken in Sennaar and Kordofan were trained by French officers, and in 1823 the army thus organized amounted to 24,000 men. In 1824 Ibrahim Pasha was sent with a powerful fleet to assist the Turks in suppressing the Greek insurrection. The fleet was engaged at Navarino (1827), and Ibrahim supported the contest till in 1828 the European powers compelled him to evacuate the Morea. In 1831 Mehemet Ali sent an army of 38,000 men into Syria under command of Ibrahim. This step brought him into immediate conflict with his suzerain the sultan, to whom he still professed allegiance. Ibrahim took Acre after a long siege, and rapidly overran Syria, defeating the Turks in a great battle at Homs in July, 1832. He then advanced into Asia Minor, and at Konieh encountered the grand vizier Reshid Pasha with 60,000 men, his own army being less than 30,000. The Turks were routed, Reshid was made prisoner, and Ibrahim was within six days' march of Constantinople, when the European powers intervened and compelled Mehemet Ali, in May, 1833, to accept a treaty by which the whole of Syria and the district of Adana in Asia Minor were ceded to him, besides the island of Candia, which he had formerly received for his services in Greece. The sultan was not disposed to submit quietly to the losses inflicted by his rebellious vassal; and in June, 1839, after long preparation, the Turkish fleet sailed for Egypt, and an army of 80,000 men commanded by Hafiz Pasha invaded Syria. It was met by Ibrahim with 46,000 men at Nizib, June 24, and utterly routed in less than two hours. Hardly had the news of this triumph reached Alexandria when the Egyptian fleet entered that port, bringing with it the whole Turkish fleet, which had through treachery surrendered without a battle. The Turkish empire was again preserved from destruction by the intervention in 1840 of Great Britain, Russia, Austria, and Prussia, although France, under the short ministry of Thiers, strongly favored Mehemet Ali. Alexandria was blockaded, and a British fleet bombarded and captured Beyrout and Acre. Terrified by these vigorous demonstrations, Mehemet Ali early in 1841 accepted terms of peace dictated by the allies, by which the pashalic of Egypt was secured to him and his descendants, on condition of paying one quarter of his clear revenues to the sultan as tribute, restoring to him his fleet and the Syrian provinces, and limiting his own army to 18,000 men. Henceforth Mehemet Ali devoted himself to the internal improvement of Egypt. The administration of the government was reformed on European models and under European advice. With few exceptions all former usages were destroyed, and an entirely new system of government was formed. Cotton was largely cultivated, and many extensive manufactures were created. In 1847 Mehemet Ali for the first time visited Constantinople,

where he was well received, and had the rank of vizier conferred upon him. In 1848 he became imbecile from age, and his son Ibrahim was appointed viceroy in his stead; but the latter died two months afterward while his father yet lived, and was succeeded by his nephew Abbas Pasha.

MÉNUL, Étienne Henri, a French composer, born at Givet in the Ardennes, June 24, 1763, died in Paris, Oct. 18, 1817. He was of humble extraction, and having shown a strong taste for music was taken to Paris at the age of 16, and instructed by Gluck. He wrote three or four entire operas, but did not appear before the public as a composer until 1790, when his *Euphrosine et Coradin*, for which Hoffmann wrote the text, was produced with great success. His *Stratonice* (1792) established his reputation, and his national hymn, *Le chant du départ*, after Chénier's text, gave him a wide popularity, and was followed by similar songs. Critics complained of a lack of graceful melodies in his operas, and of a dryness and monotony in the harmony and accompaniments. In his opera *Uthal* (1806), a work of great vigor written upon an Ossianic subject, he excluded the violins from the orchestra, substituting the violas. In his masterpiece, *Joseph* (1807), he vindicated his claim to be ranked among great composers, and it has frequently been performed in England as an oratorio. He composed in all 42 operas, besides ballet music and instrumental pieces, including the *Ouverture du jeune Henri*, an admirable specimen of descriptive music. He was a member of the institute, an inspector of the conservatory, and professor of composition at the royal school of music and declamation.

MEIGGS, Henry, an American merchant, born in Catskill, N. Y., in 1811. He began business as a contractor in Boston, removed thence to New York, made a fortune in the lumber business, and lost it in the crisis of 1837, but recovered from bankruptcy in two years. In 1848 he sailed in a vessel loaded with lumber for San Francisco, where he sold the cargo for 20 times its cost. He next built a wharf and a saw mill on the bay, and sent 500 men into the woods to fell trees. His immense business was prostrated by the panic of 1854, and to save himself he resorted to irregular proceedings, in consequence of which he departed secretly by sea with his family, Oct. 5. He was next heard of as builder of bridges on the Valparaiso and Santiago railroad in Chili. In 1858 he contracted with the Chilean government to complete the road in four years, for \$12,000,000. He finished it in two years, and his net profits were \$1,326,000. In 1867 he contracted to build a railway from Mollendo to Arequipa, Peru, which he completed on Jan. 1, 1871, making an enormous profit. He celebrated the event with a dinner which cost \$200,000, and distributed \$550,000 worth of gold and silver medals. In 1870 he contracted to build six other railways in Peru for \$125-

000,000, of which three are finished, and the others nearly so (1875). All his liabilities in California have been paid with interest, and the legislature has invited him to return.

MEIGS. I. A S. E. county of Tennessee, bounded N. W. by the Tennessee river; area, 215 sq. m.; pop. in 1870, 4,511, of whom 436 were colored. The surface is hilly and the soil fertile. The chief productions in 1870 were 29,603 bushels of wheat, 176,733 of Indian corn, 18,776 of oats, 47,101 lbs. of butter, and 456 bales of cotton. There were 996 horses, 1,069 milch cows, 1,719 other cattle, 4,392 sheep, and 8,098 swine. Capital, Decatur. II. A S. E. county of Ohio, bordering on West Virginia, and bounded E. by the Ohio river; area, 425 sq. m.; pop. in 1870, 31,465. It has a broken surface and clayey soil. There are mines of coal along the river, and large salt works. The chief productions in 1870 were 140,267 bushels of wheat, 479,933 of Indian corn, 102,980 of oats, 163,132 of potatoes, 91,034 lbs. of wool, 489,087 of butter, and 19,464 tons of hay. There were 4,929 horses, 5,360 milch cows, 8,968 other cattle, 28,444 sheep, and 13,253 swine; 6 manufactories of furniture, 1 of forged and rolled iron, 1 of nails and spikes, 2 of iron castings, 2 of engines and boilers, 10 of salt, 1 of woollen goods, 6 tanneries, 12 saw mills, 1 planing mill, 7 flour mills, and 1 ship yard. Capital, Pomeroy.

MEIGS, James Atkins, an American physician, born in Philadelphia, July 31, 1829. He graduated at Jefferson medical college in 1851, became professor of the institutes of medicine in the Philadelphia college of medicine in 1857, and in 1859 was transferred to the same chair in the medical department of Pennsylvania college, and in 1868 to Jefferson medical college. He edited Kirke's "Manual of Physiology," contributed to Nott and Gliddon's "Indigenous Races of the Earth" an article on "The Cranial Characteristics of the Races of Men," and has published various other scientific papers.

MEIGS, Return Jonathan, an American soldier, born in Middletown, Conn., in December, 1740, died at the Cherokee agency, Georgia, Jan. 28, 1823. At the commencement of the revolutionary war he raised a company and marched to Cambridge, and subsequently accompanied Arnold to Quebec, where he was taken prisoner. After being exchanged in 1776 he raised a regiment and was appointed its colonel. He distinguished himself at Sag Harbor, for which he received the thanks of congress and a sword, and at the capture of Stony Point. In 1788 he settled at Marietta, O. In 1801 he was appointed Indian agent of the Cherokees, among whom he passed the remainder of his life. His journal of the expedition to Quebec, inserted in the "American Remembrancer" for 1776, was published with an introduction and notes by C. T. Bushnell (New York, 1864).

MEINERS, Christoph, a German historian, born in a village of Hanover in 1747, died in Göttingen, May 1, 1810. He was educated at

the university of Göttingen, where in 1772 he was appointed professor of philosophy, and subsequently vice rector. He was charged by the czar Alexander with the task of selecting professors of science and literature for the Russian colleges. Of his numerous works, the most important are devoted to the history of religion, philosophy, and science.

MEININGEN, a town of Germany, capital of the duchy of Saxe-Meiningen, situated in a narrow valley on the right bank of the Werra, and on the Werra railway, 40 m. S. W. of Erfurt; pop. in 1871, 8,876. The Jews, who are numerous, have built a fine quarter, and the town was prosperous until the autumn of 1874, when four fifths of the houses were burned, the quaint old town hall and other public buildings being swept away. The ducal palace (Elisabethenburg), with a park, and a modern Gothic chapel and works of art and a library of 80,000 volumes, escaped the flames. Near Meiningen is the village of Bauerbach, where Schiller resided in 1782-'3. (See SAXE-MEININGEN.)

MEISSEN, a town of Saxony, on the Elbe, 12 m. N. W. of Dresden; pop. in 1871, 11,455. It contains a castle founded by Henry the Fowler, and a fine Gothic cathedral, said to have been built by the emperor Otho I. The town is noted for its manufactures of porcelain, known as Dresden china. It also produces carved ivory ware and other similar articles, and has a considerable trade in wine and fruits. In the middle ages it was the capital of the margraves of Meissen (or Misnia, which included Dresden, Bautzen, and other towns) until their removal to Dresden, after which it continued to be the residence of the burgraves and the bishops until the reformation. It suffered much during the thirty years' war; the bridge over the Elbe was partially destroyed by the French in 1813, and again in 1866, during the war between Prussia and Austria.—The margravate, which arose under Henry the Fowler and his son Otho I., was ruled by members of various families till the close of the 11th century, when it fell to the house of Wettin, in which it soon after became hereditary. Under this house the margravate rose to considerable power, and in 1423 Frederick the Warlike, in reward for services in the Hussite war, received from the emperor Sigismund the duchy of Saxony with the dignity of elector. In the division of the Saxon dominions in 1485, Meissen fell to the younger or Albertine line. (See SAXONY.)

MEISSNER, Alfred, a German poet, born at Teplitz, Oct. 15, 1822. He is a grandson of the voluminous miscellaneous author August Gottlieb Meissner (1753-1807). He studied medicine, taking his degree at Prague in 1846. To elude the Austrian censorship, he published in the same year at Leipzig his famous epic poem *Ziska* (10th ed., 1867). He long resided chiefly in Paris, and returned to Prague in 1850, where he and Moritz Hartmann were the principal representatives of the liberal school

of German poetry in Bohemia, a 10th edition of his *Gedichte* appearing in 1867. Some of his effusions, especially *Der Sohn des Atta Troll* (1850), abound with the peculiar sarcasm and pathos in which Heine excelled, and he published *Erinnerungen an Heine* (1854). Among his novels are *Zwischen Fürst und Volk* (3 vols., 2d ed., 1861), illustrating the revolution of 1848; *Zur Ehre Gottes* (2 vols., 1861); and *Schwarzgelb* (8 vols., Berlin, 1864; popular edition, 1 vol., 1866). His other writings include *Charaktermasken* (3 vols., Leipsic, 1861-'3); *Novellen* (2 vols., Leipsic, 1864); *Die Kinder Rom's* (4 vols., Berlin, 1870); and *Rococo-Bilder* (Gumbinnen, 1871).

MEISSONIER, Jean Louis Ernest, a French painter, born in Lyons about 1813. He studied his art in Paris under Léon Cogniet, exhibited in 1836 his "Little Messenger," and soon acquired a reputation as a painter of miniature subjects of exquisite finish and delicacy. Among his best known pictures are "The Chess Players," "The Reader," "A Game of Piquet," and "The Skittle Players." Among his larger pictures are "A Charge of Cavalry" (1867), which was sold for 150,000 francs, and is in a private gallery in Cincinnati, and "The Emperor at Solferino" (1864). He has made designs for Balzac's *Comédie humaine*, "Paul and Virginia," and other works. His pictures bring great prices, and there are several of them in the United States.—JEAN CHARLES, his son and pupil, has attained distinction as a painter, particularly for his portraits.

MEJERDA (anc. *Bagradas*), a river of northern Africa, formed by several streams which rise in the Atlas mountains in Algeria, and running N. and N. E. to the gulf of Tunis, into which it falls, 24 m. N. of the city of that name. Its whole course is about 200 m., and it is the only considerable river of Tunis. Toward the sea it enters a wide plain whose numerous lakes or ponds seem to have been formed by inundations of the river. Its waters are deeply colored by the soil, and the sediment which it bears down has enlarged its delta and made alterations in the coast line. Its whole lower course has changed, the ruins of Utica now standing close to its left bank. In ancient times it flowed nearer to Carthage.

MEJIA, Tomas, a Mexican soldier, born about 1812, executed in Querétaro, June 19, 1867. He was of pure Indian blood and of humble origin; but he acquired such influence among the natives of the Sierra Gorda of Guanajuato as to be styled the "king of the mountains," and for nearly 20 years he was conspicuous in the Mexican revolutions. He bore an honorable part in the war with the United States in 1847-'8, and in 1849 was sent to suppress an insurrection in his native state, headed by Marquez. In 1855 he "pronounced" against Comonfort, but soon submitted. The next year he headed an insurrection in the interest of the church party, and took Querétaro. In 1857 he was second in command of the revolution-

ary forces in San Luis Potosí, but was defeated in several actions, and obliged to capitulate. In 1858 he drove Juárez and his government successively from Querétaro and Guanajuato, and during the ensuing three years maintained the Sierra for Zuloaga and Miramon. After the triumph of Juárez in 1861, Mejia still kept up a guerilla warfare for a considerable time. He was a firm supporter of Maximilian, from whom he received high honors. Captured with him at Querétaro, May 15, 1867, he was tried, condemned, and executed.

MEKHITAR, or *Mechitar*, the founder of a congregation of Armenian monks, called after him Mekhitarists, born in Sebaste (Sivas) in Asia Minor, Feb. 7, 1676, died April 29, 1749. The name Mekhitar, signifying "comforter," was given him on entering a convent of the Antonian monks; his original name was Manuk. He founded a new religious congregation at Constantinople in 1701; but their persecution by the Armenian patriarch, on account of their union with Rome, induced him to send a number of his disciples to the Morea, at that time belonging to the republic of Venice, from which the congregation received in 1703 permission to build a church and convent at Modon. In 1715, during a war between Venice and Turkey, Mekhitar went with 11 disciples to Venice, whither the rest of the congregation, about 70 in number, followed him in 1717, after the capture of Modon and the destruction of the buildings by the Turks. The government of Venice gave to the congregation possession of the island San Lazzaro, near Venice, "for all future times," where it became very prosperous. The Mekhitarists take the usual monastic vows, and pledge themselves to go wherever their superiors may send them, and to labor especially for the advancement of a Christian Armenian literature. They have furnished the best editions of classic Armenian writers, and translated standard European works into Armenian. Not only Catholic literature, but even works like Ranke's "History of Germany during the Reformation," are included in their publications. Among the most valuable of their original works are a "History of Armenia," by Father Tchamtchean (died 1823), in 3 vols.; and a "History of Armenian Literature," by Father Somal, abbot of San Lazzaro (Venice, 1829). From San Lazzaro the congregation have spread to all countries in which Armenians reside, in particular over Italy, Austria, Turkey, Russia, and Persia. Next to San Lazzaro, their most important establishment is that of Vienna, founded in 1811, which has devoted itself to the publication of German Catholic books. It has a branch at Munich, with schools there and in Vienna. A legacy of a rich Armenian in Madras enabled them to establish a learned institution in Padua for the education of laymen, as that of San Lazzaro serves mostly for clergymen. In 1846 they founded a college in Paris, which has a

high reputation.—See Boné's *Couvent de St. Lazaro à Venise* (Paris, 1837).

MEKONG, or **Cambodia**, the chief river of the Indo-Chinese peninsula (Further India), rises near the E. extremity of the main range of the Himalaya mountains, in the S. E. portion of Thibet, flows S. E. through the Chinese province of Yunnan, the E. part of Burmah, Laos, Siam, Cambodia, and French Cochinchina, and empties through several channels into the China sea near Cape St. Jacques; length, about 1,800 m. In the early part of its course, in Thibet and China, it is called the Lan-tsang; the Burmese call it Kin-lung; while the name Mekong, which has now become its most common designation among Europeans, is locally applied to that longest portion lying in Siamese and Cambodian territory. For about 1,000 m. from its source the Mekong flows through mountainous regions and among some of the most remarkable of the Indian ranges, beginning with the Himalaya proper, and ending with the long chain that extends N. W. and S. E. through the peninsula of Further India. Leaving the main ridge of the latter chain in Laos, in about lat. 18° N., and diverging E. and S. E., it flows through the great central plain of the southern peninsula, irrigating it thoroughly by annual overflows which take place between September and November, and rendering it a region of the greatest fertility. The navigation of the upper river is difficult and dangerous, its bed, even in the widest parts, being obstructed with shifting bars or projecting reefs. Excepting in the lower portion of its course, rapids are frequent. The scenery along the upper Mekong is of the wildest and most rugged character, the stream often flowing through very deep gorges in the mountains, and in some places tunnelling the cliffs into fantastic forms. For some distance from its mouth, however, the river is navigable even for large vessels, and Panomping, the capital of Cambodia, is easily reached by shipping from the coast.—In 1866–8 the Mekong was explored as far as the borders of Burmah by a French government commission, which made an elaborate report upon the river and its valley. See "Travels in Indo-China and the Chinese Empire," translated from the French of Louis de Carné (London, 1872), and the report of the commission, published in Paris in 1873.

MELA, **Pomponius**, a Roman geographer in the time of the emperor Claudius. He was a native of Spain, and is said to have been the first Roman author of a methodical treatise on geography. His work is entitled *De Situ Orbis*, and consists of three books, which give a brief description of the whole world as known to the Romans. The text is corrupt, but the style is simple and the Latinity pure. The *editio princeps* appeared at Milan in 1471; the best editions are by Tzschucke (7 vols., Leipsic, 1807) and Parthey (Berlin, 1867).

MELAMPUS, in Grecian mythology, son of Amythaon by Idomene, Aglaia, or Rhodope,

esteemed the first mortal who was endowed with the gift of prophecy, and who practised the medical art. He is said to have introduced the worship of Bacchus into Greece.

MELANCHOLIA. See **INSANITY**.

MELANCHTHON, **Philipp**, the second leader of the Lutheran reformation, born at Bretten, in the present grand duchy of Baden, Feb. 16, 1497, died in Wittenberg, April 19, 1560. His family name was Schwarzerd (black earth), but his uncle, the celebrated scholar Reuchlin, translated it into the corresponding Greek Melanchthon. He was educated at the Latin school of Pforzheim, and at the universities of Heidelberg and Tübingen. He was uncommonly precocious, graduated as master of arts in 1514, began to lecture at Tübingen, and published a Greek grammar, an edition of Terence, and projected a new edition of Aristotle's writings, as a means of reviving the true philosophy. He took rank at once among the very first Greek and Latin scholars of the age. In 1516 Erasmus said of him: "My God! what expectations does Philipp Melanchthon excite, who is yet a youth, yea, we may say a mere boy, and has already attained to equal eminence in the Greek and Latin literature. What acumen in demonstration, what purity and elegance of style, what comprehensive reading, what tenderness and refinement of his extraordinary genius!" With his classical studies he combined a careful study of the Bible in the original. This, in connection with the influence of Reuchlin, predisposed him favorably to the great movement of the reformation, which commenced during his residence at Tübingen with the controversy between Luther and Tetzel in 1517. On the recommendation of Reuchlin he was called to the professorship of Greek at the rising university of Wittenberg in 1518, and thus became the colleague of Luther. Although he was subsequently called to other prominent positions in Nuremberg, Tübingen, Heidelberg, and even France and England, he preferred remaining at Wittenberg to the close of his life. He was the most popular teacher of the university, and attracted students from every direction. At first he lectured on classical literature, but in 1519 he graduated as bachelor of divinity, and thenceforward devoted himself mainly to theology. Yet he was never ordained, nor would he ever accept the title D. D., and in a discourse in 1533 uttered a warning against conferring it too frequently. He never ascended the pulpit, although he frequently wrote sermons for others, and delivered in his house practical lectures on the Gospels in Latin, which were taken down by some hearers and published as sermons (*Postilla*). He was therefore a lay theologian; but as such he wielded a powerful influence in that great ecclesiastical movement which makes the 16th century one of the most important periods in church history. He acted a prominent part in the German reformation, and is inferior only to Luther and Calvin among

the reformers. His modesty, gentleness, and peacefulness stand in strange contrast with the furious contest into which he was reluctantly drawn. But, while Luther had to brace up his courage and to arm himself for the conflict, Melanchthon was admirably adapted to moderate the fiery zeal of his colleague, and to aid him with his superior learning. In 1519 he attended the Leipsic disputation, and defended Luther with his pen against Dr. Eck, the champion of the church of Rome. In 1521 he published the *Loci Communes*, the first system of evangelical Protestant theology, which passed through more than 50 editions during his lifetime, and was used long after his death as a text book in the Lutheran universities. At first it was but a fresh effusion of the vigorous evangelical faith in the Scriptures and the all-sufficient grace of God in Christ; but subsequently it was greatly enlarged and improved, although it never attained the philosophical depth, logical order, and precision of Calvin's "Institutes." In 1522 and the following years he wrote several commentaries which attracted much attention, but were overshadowed afterward by some of Luther's and especially by Calvin's commentaries. He also lent valuable aid to Luther in the translation of the Bible, which was commenced in 1522 and completed in 1534. In 1529 he accompanied his prince to the diet of Spire, and helped to draw up the famous protest of the evangelical minority against the Catholic majority of the diet, which gave rise to the name Protestants. In the same year he attended the unsuccessful theological conference with the Zwinglians at Marburg. At that time he agreed with Luther's view on the Lord's supper. In 1530 he spent several months at Augsburg during the session of the diet, and wrote his most important official work, the "Augsburg Confession," which was signed by the Lutheran princes, publicly read before the diet, and became by general consent the principal symbolical book of the Lutheran church. Soon afterward he replied to the "Refutation" of the Catholic divines by the "Apology of the Confession," a work of great theological merit, and likewise of symbolical authority in the Lutheran church, though it is far less used and quoted than the Confession. Subsequently he made considerable modifications and alterations in the Confession, with the view to improve and to adapt it to the Reformed churches. Hence the difference between the "Altered" Augsburg Confession of 1540 and the "Unaltered" of 1530. The principal change refers to article X. on the Lord's supper, and the omission of all those words which favored the view of the corporeal presence and an oral fruition of the body and blood of Christ by all communicants. The changes were at first passed by or acquiesced in, but subsequently gave rise to violent controversies. In 1536 he endeavored, with Bucer, to bring about a doctrinal compromise between the Lutheran and

Zwinglian views on the Lord's supper. In 1537 he signed the "Articles of Smalcald," drawn up by Luther, but added the singular proviso that he would acknowledge the supreme authority of the pope *jure humano*, if he would tolerate the freedom of the gospel; *i. e.*, he was willing to become a semi-Catholic, if the pope would become a semi-Protestant. In all the conferences with the Roman Catholics, at Worms (1540), and at Ratisbon (1541), he was the delegate of the Lutheran party. In these conferences, and especially in the adiaphoristic controversy concerning the Augsburg and the Leipsic Interim (1548), he incurred the censure of the more determined Protestants. His motives were always disinterested; yet his timidity, modesty, love of peace, and the hope of an ultimate reconciliation of Catholicism and Protestantism, which he probably cherished to the end of his life, led him to make many concessions, and to agree to compromises which satisfied neither party and were soon broken up. This compromising disposition, and his doctrinal changes on the Lord's supper and other articles, together with various personal causes, disturbed his relations with Luther; yet their friendship was never entirely dissolved. Luther, though often dissatisfied with Melanchthon's timidity and vacillation, never openly took ground against him; and Melanchthon, in his funeral oration on Luther, called him the Protestant Elijah, and lamented his death as a great calamity for the church of Christ. From Luther's decease in 1546 to his own death in 1560 Melanchthon was the acknowledged leader of the German reformation, and was consulted by princes and universities on all important events and measures. In the mean time the Lutheran divines became more and more divided between two schools, the strict old Lutherans, headed by Flacius, Amsdorf, Hessus, and other violent polemics against Roman Catholics as well as Calvinists, and the more moderate, conciliatory, and progressive Melanchthonians, or Philippists, as they were generally called, after the Christian name of their leader. Melanchthon bore the violent abuse of his former friends and pupils with patience and meekness. What he lost in the opinion of the zealots for exclusive Lutheranism he gained in esteem and confidence with the Reformed churches in and out of Germany. He stood in friendly correspondence with Calvin to the last, and was invited to England. In 1551 he set out for the council of Trent as delegate from Saxony, when Maurice suddenly changed the aspect of affairs by his famous military movement against the emperor, and dispersed the council. The peace of Augsburg in 1555 materially improved the political condition of the Lutherans, and secured to them liberty of worship within the empire. In 1557 he attended, at the request of the emperor, the last theological conference with the Roman Catholics at Worms. He was received with great honor, but the

conference ended in a complete failure, and the hope of reconciliation utterly vanished. This, in connection with the violent eucharistic or crypto-Calvinistic and other doctrinal controversies in the Protestant party, the unsparring attacks of the strict Lutheran party, and various domestic afflictions, greatly embittered the last years of his life, and broke down his weak physical frame, already exhausted by incessant study and application. Nevertheless he continued to write *responsa et vota* to the last. A few days before his decease he wrote in Latin the reasons which made death welcome to him, viz.: on the left side, deliverance from sin and from the acrimony and fury of theologians; on the right side, the light of eternity, the vision of God and his Son, and the full knowledge of those wonderful mysteries of faith which we can but imperfectly understand in this life. On a journey to Leipsic in March, 1560, he contracted a cold which proved fatal. His last and greatest care and sorrow was the distracted condition of the church; his last and most fervent prayer was for the unity of believers. When Peucer, his son-in-law, asked him whether he desired anything, he replied: "Nothing but heaven;" and soon afterward he breathed his last. He was buried in the principal church of Wittenberg, by the side of Luther.—As a reformer, Melanchthon was admirably adapted to assist Luther, and to supplement him. He was better suited for the quiet study than the commotion of public life. Inferior to Luther in strength of intellect and will, he surpassed him in scholarship and moderation of spirit. The one was the hero, the other the theologian of the German reformation. He reduced the new ideas to order and system, and commended them to literary men, while Luther powerfully impressed them upon the people. Melanchthon was of small stature and delicate frame, but had fine blue eyes and a noble forehead. He married in 1520 the daughter of the burgo-master of Wittenberg, and lived happily with her till her death in 1557. He called his nursery the "little church" (*ecclesiola Dei*), and was occasionally seen rocking the cradle with one hand and holding a book in the other. He cared little or nothing for money, was extremely good-natured and benevolent, and unblemished in all his moral relations. The otherwise beautiful symmetry of his character is marred by but one serious error (and this he shared with Luther), the qualified countenance reluctantly given to the double marriage of Philip, landgrave of Hesse.—The works of Melanchthon embrace a Greek and Latin grammar, editions of and commentaries on several classics and the Septuagint, Biblical commentaries, doctrinal and ethical works, official documents, declamations, dissertations, responses, and a very extensive correspondence. The first edition of his collected works appeared at Basel, in 5 vols. fol., in 1541; the second, under the editorial care

of Peucer, at Wittenberg, in 1562-'4; but both are incomplete. The most valuable edition is that of Bretschneider and Bindseil in the *Corpus Reformatorum* (28 vols. fol., 1834-'60). The life of Melanchthon has been written by Camerarius (1566), Niemeier, Köthe, Ledderhose (Heidelberg, 1847; translated into English by Krotel, Galle (1840), Matthes (1841), Wohlfahrt (1858), Planck (*Melanchthon, Præceptor Germaniæ*, 1860; new ed., 1866), and Schmidt (1861).—On April 19, 1860, the tricentennial anniversary of Melanchthon's death was celebrated with great enthusiasm throughout Protestant Germany. At Wittenberg, where "he lived, taught, and died" (as the inscription on his house reads), the corner stone was laid of a monument to his memory, to be erected beside that of Luther. The festival oration was delivered by Dr. Nitzsch of Berlin, the last surviving professor of the once famous university of Wittenberg. At the same hour the foundation of a similar monument was laid at Bretten, his birthplace.

MELANESIA. See MICRONESIA.

MELANOSIS (Gr. *melânev*, to blacken), a morbid growth on the human body, characterized by the deposit of a black pigment. For a long time this was looked upon as a distinct disease, and melanotic tumors formed a class by themselves; but it is now believed that melanosis may occur in any of the textures, natural or morbid. It is found in the lungs, in the bronchial and mesenteric glands, and in the sympathetic ganglia, mixed with new deposit as cancer and tubercle. The coloring matter is generally thought to be derived from the hematine of the blood. The black deposit in the air cells of miners is a mere accumulation of carbonaceous dust.

MELAZZO. See MILAZZO.

MELBOURNE, a city of S. E. Australia, capital of the colony of Victoria, on the banks of the Yarra-Yarra river, about 9 m. from its mouth, at the upper end of the large estuary of Port Phillip, 450 m. S. W. of Sydney; lat. 37° 48' S., lon. 144° 58' E.; pop. in 1841, about 4,000; in 1846, 10,000; in 1851, 23,000; in 1854, 76,000; in 1857, 100,000; in 1869, 170,000; in 1871, 191,254. The principal part of the town is on the N. side of the river, but some wards lie on the south, where South Melbourne, Sandridge, St. Kilda, and the W. part of South Yarra are comprised within the city boundary. North and South Melbourne are connected by a bridge. On the N. side the chief part of the town lies in a valley with its extremities carried over two hills. The S. side is flat and swampy, excepting the sandy margin of Hobson's bay, where Sandridge stands. The streets of Melbourne are mostly laid out at right angles, wide, straight, and running the whole length or breadth of the town. They are macadamized in the middle, well drained, mostly flagged at the sides, and lighted with gas. In the original plan of the city lanes alternating with the main streets

were left, to afford back entrances to the houses; but as the value of property increased these lanes were occupied by merchants and tradesmen, became independent streets, and now form a very unsightly feature in the older part of Melbourne. The town is generally well built of brick and stone. Melbourne became the seat of a Roman Catholic bishop in 1847, and of an Anglican bishop in 1848; in April, 1874, the Catholic diocese was erected into an archbishopric. The most numerous churches are those of the church of England, Wesleyans, and Roman Catholics, and there are also places of worship for Independents, Lutherans, Baptists, and other Protestant denominations, as well as for Jews. The Wesleyan church opened in August, 1858, is said to be one of the handsomest church edifices belonging to that denomination in the world. Among the prominent buildings are the two houses of parliament, the custom house, the treasury, the post office, the free library with a museum of art and a reading room, several theatres, and an elegant club house. The university of Melbourne was opened in April, 1855. It occupies a beautiful site N. of the city, and has 40 acres of land, which form part of extensive pleasure grounds. The buildings are arranged in a parallelogram. The institution has departments of law, civil engineering, and arts, and enjoys an annual government appropriation of £9,000. A public museum of natural history, manufactures, and mining is attached to it, and also a gallery of fine arts, a botanic garden, and a bureau of statistics, with a fine observatory. The city has a well appointed public library, and there are numerous

mediate neighborhood of the city, the chief of which are the royal park and the Carlton and Fitzroy gardens. Collingwood, Brighton, Richmond, St. Kilda, and other suburbs of Melbourne are studded with beautiful villas and terraces. Melbourne has regular steam mail service with England *via* the isthmus of Suez, and there are steamers to all the neighboring ports. Four railways radiate from the city, besides a short one connecting it with the harbor, and there are good roads to all the principal gold fields. The climate is on the whole cooler than is generally experienced in the same latitude N. The mean temperature of January (midsummer) is 66°, the highest 101°, and the lowest 48°; while the average daily variation of the month is 19°. There is a great proportion of dry sunny weather. The annual fall of rain, taken from the mean of five years, gives 32.63 inches. The wettest months are from April to November inclusive. —In commerce Melbourne ranks as the first port in the British colonies, an importance due to the gold discoveries in 1851. Besides gold, the chief exports are wool, tallow, hides, and other kinds of raw produce. The imports in 1872 amounted to \$66,628,819 and the exports to \$67,504,170, the latter including \$25,000,000 gold and \$21,000,000 wool. The principal trade is with England, and that with the United States is not inconsiderable. The customs duties in 1872 amounted to \$6,913,183. The Melbourne manufactories of mining machinery and other articles are steadily increasing. Ships drawing 24 ft. of water can come up Port Phillip as far as Hobson's bay at the mouth of the Yarra-Yarra; but vessels requiring more than 9 ft.

cannot get over the bars. Although the distance to the bay by the course of the river is 9 m., it is not quite 2 m. by land, and a railway with an extensive jetty at its lower terminus has been made, connecting Melbourne with Port Phillip at Sandridge. There is another railway to Williamstown, on the opposite side of Hobson's bay, which, though considerably longer, has the advantage of better shelter for ships lying at the jetty. A ship railway has been constructed here capable of taking up very large vessels. From the anchorage in Hobson's bay to the Heads of Port Phillip the distance is



The Post Office, Melbourne.

scientific and literary institutions. The Yanyan water works, opened Dec. 31, 1857, supply the city from an artificial lake formed in the valley of the Plenty river, 18 m. distant. There are several pleasure grounds in the im-

mediate neighborhood of the city, the chief of which are the royal park and the Carlton and Fitzroy gardens. Collingwood, Brighton, Richmond, St. Kilda, and other suburbs of Melbourne are studded with beautiful villas and terraces. Melbourne has regular steam mail service with England *via* the isthmus of Suez, and there are steamers to all the neighboring ports. Four railways radiate from the city, besides a short one connecting it with the harbor, and there are good roads to all the principal gold fields. The climate is on the whole cooler than is generally experienced in the same latitude N. The mean temperature of January (midsummer) is 66°, the highest 101°, and the lowest 48°; while the average daily variation of the month is 19°. There is a great proportion of dry sunny weather. The annual fall of rain, taken from the mean of five years, gives 32.63 inches. The wettest months are from April to November inclusive. —In commerce Melbourne ranks as the first port in the British colonies, an importance due to the gold discoveries in 1851. Besides gold, the chief exports are wool, tallow, hides, and other kinds of raw produce. The imports in 1872 amounted to \$66,628,819 and the exports to \$67,504,170, the latter including \$25,000,000 gold and \$21,000,000 wool. The principal trade is with England, and that with the United States is not inconsiderable. The customs duties in 1872 amounted to \$6,913,183. The Melbourne manufactories of mining machinery and other articles are steadily increasing. Ships drawing 24 ft. of water can come up Port Phillip as far as Hobson's bay at the mouth of the Yarra-Yarra; but vessels requiring more than 9 ft.

2 m. across, but this is occupied by foul ground on either side, which leaves a channel little more than a mile broad. Through this narrow passage the ebb and flood tides sweep over the uneven bottom with great force, and raise a sea which, when there is a strong wind from the opposite direction, is often fatal to small craft. Strong fortifications occupy the points of land at either side of the entrance. The rise and fall of the tide is about 3 ft. Melbourne has steam flour mills, tallow-boiling and meat-preserving establishments, brass and iron foundries, breweries, distilleries, and manufactories of clothing and woollen blankets. —The site of Melbourne was selected and occupied by a small colonizing party from Tasmania in 1835. Two years afterward the town was officially recognized and named in honor of Lord Melbourne, the British prime minister, by the government of New South Wales, to which Melbourne, together with the surrounding country, then called the Port Phillip district, belonged until the formation of a separate colony in 1851 under the name of Victoria.

MELBOURNE. I. William Lamb, viscount, a British statesman, born in London in 1779, died there, Nov. 24, 1848. He was the eldest son of the first Viscount Melbourne, and after an education at Trinity college, Cambridge, and the university of Glasgow, was in 1804 called to the bar at Lincoln's Inn. In 1805 he entered parliament as a supporter of Fox and the whigs, but later he served under Canning as secretary for Ireland. In 1828 he succeeded to his title, and two years later he entered the cabinet of Earl Grey as home secretary. Upon the retirement of the latter in 1834 he became first lord of the treasury and prime minister, in which office he remained, with the exception of a brief period in 1834-'5, when Sir Robert Peel temporarily assumed the premiership, till 1841, when he was again succeeded by Peel. His administration was distinguished by no important political event, but was rendered popular by the tact and personal qualities of the premier. **II. Caroline** (PONSONBY), known as Lady Caroline Lamb, wife of the preceding, born Nov. 13, 1785, died in London, Jan. 26, 1828. She was the only daughter of the third earl of Bessborough, and at 20 years of age was married to the future premier. Having tastes congenial with those of her husband, she shared with him the classical studies in which they were both proficient, and also made herself mistress of several of the modern languages. In 1816 she published "Glenarvon," a novel of which the hero was supposed to shadow forth the character and sentiments of Lord Byron, for whom about 1813 she had conceived a romantic attachment. Byron severed his relations with her in the well known lines to her written a short time before his departure from England; notwithstanding which she still cherished a regard for him, and it is related that, coming suddenly upon the hearse which

was conveying the remains of Byron to the grave, she fainted and was for some time prostrated by a severe illness. For many years she lived in seclusion in Brocket hall, and three years before her death was separated from her husband. She published two other novels, "Graham Hamilton" and "Ada Reis."

MELCHIZEDEK, or **Melchisedec** ("king of righteousness"), according to Gen. xiv. 18, a "priest of the most high God" and "king of Salem," who went forth to meet Abraham on his return from the pursuit of King Chedorlamer, brought bread and wine for the warriors, and blessed Abraham, who in return gave him a tenth of the spoils. One of the Psalms (cx. 4) contains the words, "a priest for ever after the order of Melchizedek;" and the Epistle to the Hebrews (vi. 20, vii. 1-21) represents him as a type of Christ, and his office as superior to the Aaronic priesthood. The opinions of theologians as to the person of Melchizedek and the nature of his priesthood have at all times greatly varied. With regard to his residence, they are now generally agreed that Salem was a poetical name for Jerusalem. In the ancient church, a sect, called Melchizedekites, regarded Melchizedek as an incarnation of a divine power, and as superior to Christ.

MELCHTHAL, **Arnold vom**, a Swiss patriot, born in Unterwalden in the latter part of the 13th century. His real name was Arnold von der Halden, but he assumed the name of his native village. The Austrian bailiff Landenberg having ordered the seizure of a yoke of oxen belonging to Arnold's father, the young man knocked down the menial and fled. His father refused to disclose his place of refuge, and was blinded by order of the bailiff. This cruel deed, which has been dramatized in Schiller's "William Tell," became the signal of revolution. Young Melchthal, in his retreat on the Grütli, was joined by Fürst and Stauffacher, with whom and 30 other patriots, one night in November, 1307, he took an oath to devote his life to Swiss independence. This was achieved in January, 1308, by the expulsion of the Austrians from the cantons of Unterwalden, Uri, and Schwytz, and the destruction of their castles, without bloodshed. The authenticity of the whole story, however, which is given in the *Chronicon Helveticum* of Ægidius Tschudi (died in 1572), has been questioned in more recent times, as well as the story of William Tell.

MELCOMBE, **Lord**. See DORINGTON.

MELEAGER. **I.** A mythical hero of Greece. The legends respecting him are discordant. According to one, he was the son of Mars and Althæa, and to others, of Cæneus and Althæa. The prevailing legend is, that while Meleager was at Calydon, in Ætolia, the king once neglected to offer up a sacrifice to Diana, whereupon the angry goddess sent a monstrous boar to ravage the fields. Finally Meleager, with several companions, went out to

hunt the boar, which was killed by him. This expedition is known as the Calydonian hunt. It was a favorite subject with ancient artists. Meleager is usually represented as a robust hunter, with curly hair, wearing the Ætolian chlamys, and carrying a boar's head. **II.** A Macedonian general who served under Alexander the Great. At the battle of the Granicus, 334 B. C., he commanded one of the divisions of the phalanx; and in almost all the Asiatic campaigns he appears to have held the same office. On the death of Alexander (323) he was co-regent with Perdicas, and was put to death by order of his colleague. **III.** A Greek epigrammatist, who flourished about the middle of the 1st century B. C. He was a native of Gadara in eastern Palestine, and made a collection of epigrams, entitled *Στέφανος Ἐπιγραμματῶν*, from more than 40 authors. This work has perished, but 131 of his own epigrams are still extant, and have been collected and published by Manso (Jena, 1798), and most completely by Gräfe (Leipsic, 1811).

MELEGNANO, Marignano, or Marignan, a town of Italy, on the Lambro, in the province and 10 M. S. E. of the city of Milan; pop. about 4,000. It was destroyed by the emperor Frederick II. in 1239; and the Guelphs and Ghibellines signed a treaty of peace here in 1279. In September, 1515, it was the scene of a famous victory won by Francis I. of France over the Swiss in the service of the duke of Milan, which was called, from its obstinacy and the superior character of the troops on both sides, the "battle of the giants." Another French victory was gained here, June 8, 1859, four days after the battle of Magenta.

MELENDEZ VALDEZ, Juan Antonio, a Spanish poet, born at Ribera del Fresno, March 11, 1754, died in Montpellier, France, May 24, 1817. He was educated at Salamanca, where he became professor of belles-lettres. In 1780 he obtained a prize offered by the Spanish academy for the best eclogue. He was afterward employed in judicial and civil service, in Saragossa, Valladolid, and Madrid, but was banished in 1792, after the downfall of Jovellanos. After some years he was permitted to return to Salamanca, and in 1808 attached himself to the French party, sharing in its misfortunes. Once he was led out to be shot by the populace of Oviedo, whither he had been sent as a commissioner. Finally he fled to the south of France, where he lived for four years in misery, and his death was hastened by destitution. His poems embrace odes, eclogues, idyls, and pastoral dramas, of which the most popular is "Camacho's Wedding." His collected works, with a life by Quintana, were published at Madrid in 1820.

MELETIUS, or Melitius, author of the Meletian schism, born in Egypt about 260, died at Lycopolis, in the Thebais, in 326. He was made bishop of Lycopolis about 300, and during the persecution became the head of the extreme party who refused to admit the *lapsi*

to fellowship. Peter, bishop of Alexandria, who entertained more moderate opinions, having concealed himself in 305, Meletius, who had been condemned to death by the persecutors, escaped from prison, and, being second metropolitan of Egypt, undertook to set aside the authority of the absent Peter and of his vicars. He persisted in exercising full episcopal jurisdiction in Alexandria in spite of the remonstrances of the other bishops, and for this was excommunicated and deposed in a synod held there about 306. He resisted the action of the synod, and, calling his own party the pure church of the martyrs, created a schism in Egypt, which continued even after the martyrdom of Bishop Peter in 311. The council of Nice in 325 condemned the conduct of Meletius, and, while allowing him to retain the episcopal rank because he had suffered for the faith, forbade him to exercise any jurisdiction. But at that time 29 bishops had embraced his views, and four priests with three deacons in the city of Alexandria held out for him. After apparently submitting to the Nicene decision, he resumed his episcopal functions, consecrated a schismatic bishop, and a few days before his death appointed one of his own followers to be his successor. The Meletian party, without professing Arian doctrines, sided with the Arians against Athanasius. This schism disappeared early in the 5th century.

MELETIUS, Saint, bishop of Antioch, born at Melitene, near the Euphrates, about 310, died in Constantinople in 381. In 357 he was elected to succeed Eustathius, the deposed bishop of Sebaste, but soon resigned in consequence of the bitter opposition of the partisans of Eustathius. He then led a monastic life at Bercea till about 361, when he was chosen bishop of Antioch in place of the Arian bishop Eudoxius, transferred to the see of Constantinople. The election took place in a large synod of Arian and orthodox bishops, who hoped by this choice to end the schism begun in 330 by the banishment of St. Eustathius. His inaugural discourse gave great offence to the Arian party supported by the emperor Constantius; they petitioned for his removal, and after holding the see of Antioch only 30 days, he was banished to Armenia. Thus two orthodox parties came to exist side by side in Antioch, the Eustathians, who since 330 had held no fellowship with the Arians and Semi-Arians, and the great mass of the people, who now remained attached to the exiled Meletius. The bishop Euzoios, chosen by the Arians in place of Meletius, was at the head of the heterodox party. The Meletians asked the Eustathians to unite with them against the heretics, but were repulsed as infected with Arianism. Meletius was permitted to return to his flock in 362; but Lucifer of Cagliari, commissioned to examine into this charge and heal the schism between the Eustathians and Meletians, openly took part with the former, and consecrated their leader Paulinus as their bishop. Mean-

while Julian, intending to make Antioch the central seat of restored paganism, was opposed by Meletius, whom he banished again. He was recalled in 363, and held a council in which Acacius of Cæsarea and his adherents adopted the Nicene creed. In 364 Meletius was exiled a third time by the Arians, and was only recalled in 378. The Eustathians during the interval had been losing ground, the orthodoxy of Meletius became better known at Rome and Alexandria, and he himself found supporters and advocates in Basil the Great, Gregory of Nyssa, and Gregory Nazianzen. In 379 he convened in Antioch a council of 144 bishops, who condemned the Apollinarian heresy; and in 381 he presided at the first general council of Constantinople. He died soon after, and his remains were taken to Antioch and buried in the church of St. Babylas. John Chrysostom pronounced over his tomb an eloquent panegyric, Feb. 12, 386, on which day Meletius was honored as a saint by the eastern churches; his name was inserted by Baronius in the Roman martyrology for the same date.

MELI, Giovanni, an Italian poet, born in Palermo in 1740, died there, Dec. 20, 1815. He was professor of chemistry at Palermo. His compositions have procured him the titles of "the Sicilian Anacreon" and "the modern Theocritus." A small pension was granted him, and a mausoleum was erected in his honor. He employed the Sicilian dialect, and his love songs especially are extremely popular in Sicily. A complete edition of his poetical works appeared at Palermo in 1814, in 7 vols., and an additional volume was published by Agostino Lallo in 1826. A new edition of his works, in 8 vols., appeared in 1830-'39.

MELITA. See MALTA.

MELLEN, Grenville, an American poet, born in Biddford, Me., June 19, 1799, died in New York, Sept. 5, 1841. He graduated at Harvard college in 1818, studied law in Portland, and removed in 1823 to North Yarmouth, where he engaged in practice. In 1826 he pronounced in Portland before the peace society of Maine a poem on "The Rest of Empires." In 1827 he published a satire entitled "Our Chronicle of Twenty-Six;" in 1828 delivered a poem before a society of Bowdoin college on the "Light of Letters;" and in 1829 issued a volume of prose entitled "Glad Tales and Sad Tales." "The Martyr's Triumph, Buried Valley, and other Poems" was published at Boston in 1833. He resided about five years in Boston, and in New York in 1839 he began a "Monthly Miscellany," which was discontinued after a few numbers. His health was always feeble, and he died of consumption after a voyage to Cuba in 1840.

MELLIN, Gustaf Henrik, a Swedish author, born at Revolax, Finland, April 23, 1803. He studied theology at Upsal, and acquired celebrity by numerous historical novels, most of which have been translated into German. He is also the author of many historical and biographical

works, including *Fäderlandets Historia*, which has had several editions, and a history of Swedish literature (1864).

MELLONI, Macedonio, an Italian physicist, born in Parma in 1801, died in Portici, near Naples, Aug. 11, 1853. He was professor of natural philosophy in the university of Parma from 1824 to 1831, when political events compelled him to take refuge in France. Through the efforts of Arago he was appointed a professor in the college of Dôle, in the department of the Jura. Going thence to Geneva, he availed himself of the scientific instruments of Prévost and De la Rive to make several important discoveries respecting the radiation of heat, which he presented in 1833 to the French academy of sciences. His communication was received coldly, but the discoveries which it embraced subsequently procured him the Rumford medal from the royal society of London. He was enabled through the influence of Arago and Humboldt to return to Italy, and in 1839 was appointed director of the meteorological observatory then building on Mt. Vesuvius. There he made the discovery of heat in lunar light, which led to the determination of the analogy of radiant heat to light. For his presumed sympathy with liberal principles he was ejected from his post in 1849, and retired to a villa near Portici. In 1850 he published the first volume of *La termocresi, o la colorazione calorifica*, containing an account of his theory of the "coloration of light," and of his experiments on the diffusion of heat by radiation, and particularly of its transmission through transparent media. A month before his death he communicated to A. de la Rive the result of his researches in electrical induction.

MELMOTH, I. William, an English author, born in London in 1666, died there, April 6, 1743. He was called to the bar in 1693, and appears to have been treasurer of Lincoln's Inn in 1730. He is known as the author of "The Great Importance of a Religious Life Considered," of which 100,000 copies were sold. A new edition was privately printed in London in 1849, and presented to the benchers of Lincoln's Inn. **II. William**, son of the preceding, born in London in 1710, died in Bath, March 15, 1799. He was educated for the bar, but lived chiefly in retirement, and published "Letters on Several Subjects" (2 vols., 1742).

MELO, or Mello, Francisco Manuel de, a Portuguese historian and poet (who wrote in Spanish), born in Lisbon, Nov. 23, 1611, died there, Oct. 13, 1665. He early became familiar with literature, but entered the army and attained the rank of colonel. When the insurrection against Philip IV. broke out in Catalonia he was sent thither, and at the request of the king he wrote *Historia de los movimientos, separacion y guerra de Cataluña* (Lisbon, 1645; 2 vols., Paris, 1832), which ranks as a classic. After the separation of Portugal from Spain, he entered the service of his native country, but was imprisoned under a false accusation of

murder, and was for years an exile in Brazil. Many of his works are unpublished, but more than 100 volumes have been printed. His most popular poems are embraced in *Las tres musas del Melodino* (Lisbon, 1649).

MELODEON (Gr. *μελωδία*, melody), the name, at different times, of two or more unlike forms of musical instruments, but now appropriated to one of recent date, and so far excelling those before it as to be substantially a new invention. In this, externally resembling the piano, the tones are produced by touching the keys of a finger-board; each key, lifting a valve, allows a current of air from a bellows, worked meanwhile by the foot on a pedal, to agitate the corresponding one of a series of metallic free reeds; the compass is five to seven octaves. The rocking melodeon, known in America since about 1825, was unsightly, tardy in sounding, and of harsh tone. Jeremiah Carhart improved the plan of acting on the reeds by suction instead of blowing, and introduced other improvements, inventing the present instrument in 1836. The art of voicing the reeds, the most important improvement in such instruments, was invented by Emmons Hamlin in 1848. (See REED INSTRUMENTS.) In 1859, 22,000 melodeons were manufactured in the United States. But few are now made, this instrument having been almost entirely superseded by the cabinet or parlor organ, nearly 80,000 of which were manufactured in the United States in 1872.

MELODRAMA. See DRAMA, vol. vi., p. 247.

MELODY. See MUSIC.

MELON, the common name for fruits of vines of the *cucurbitaceæ* or gourd family. In England, where but one kind is cultivated, the name melon applies solely to the fruit of *cucumis melo*; but in this country we have also the fruit of a very distinct plant, *citrullus vulgaris*, and the distinction is made of muskmelon for the one and watermelon for the other. The same uncertainty surrounds the origin of the muskmelon that attaches to many of our cultivated plants; it is quite doubtful whether it has ever been found in a truly wild state, but it is supposed to have originated in India, and to have been brought thence by

on both sides; the tendrils are simple; the flowers monœcious, the sterile in small clusters and the pistillate ones solitary in the axils of the leaves; the fruit, which is variable in size, has a thick and fleshy pericarp, usually ribbed exteriorly; when ripe, the watery and stringy placentæ only partly fill the cavity, and are rejected with the seeds when the fruit is eaten. The melon reaches its greatest perfection in warm climates, but so readily does it adapt itself to cultivation that several varieties come to maturity in the short summers of New England. In England melons cannot be raised with any certainty except under glass, but in this country they are almost entirely cultivated in the open air. The soil can hardly be made too rich, and it is the custom to sow the seeds in hills which have been especially prepared with an abundance of well decomposed manure. As the young plants are attacked by various insects, a great abundance of seed is sown, and when they are large enough to run, all the plants but two or three are removed from the hills, which are made 6 or 8 ft. apart each way. In field culture no other care is given than to protect the young plants from insects by dusting with lime or ashes, but in gardens the vines are sometimes pinched at the ends to induce branching, and the fruit is turned to insure its ripening evenly; when thoroughly ripe the stem separates from its attachment to the fruit by a well defined line, and a practised eye can judge by this alone of the maturity of the fruit. Great numbers of melons are shipped from southern ports to northern cities; these are picked before they are fully mature, and come into condition for eating by the time they reach the consumer. The varieties, if grown near one another, are very difficult to keep pure, and it is the custom with those who raise melons for market to have but one variety, and to take great care in the selection of plants for seed; and each grower generally has his own particular "strain." In size the varieties range from the pocket melon, no larger than an orange, to the large Persian kinds weighing 12 or 15 lbs.; in form they are globular, oblate, or oval. In no respect is the difference greater than in the quality of the flesh; the common muskmelon, still found in some country gardens, with its name corrupted not inappropriately into mushmelon, with its dry, mealy, and nearly tasteless fruit, is so inferior to the rich, melting improved varieties, that one can hardly believe them to have had the same origin. Melons from seed brought from Armenia by missionaries were cultivated over three centuries ago at Canteluppi, a villa near Rome, and thence introduced to other parts of Europe as canteloupes; the name is still in use in some parts of Europe for a class of depressed-spherical, deeply ribbed, yellow-fleshed varieties, but in this country it is of very indefinite application, and has almost entirely passed out of use. The surface in some varieties is quite smooth,



Muskmelon Vine.

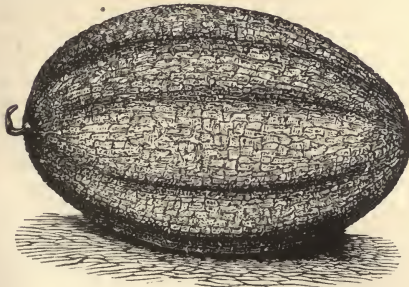
way of Persia. As with other cultivated plants of the family, the tendency to vary is great, and the forms or varieties in cultivation are numerous. The plant is a running vine, extending from 4 to 8 ft. or more, bearing large, generally heart-shaped and angled leaves, rough

but generally it is roughened with corky protuberances in the form of a network, and the abundance of this netting is in many sorts a mark of purity. It is very difficult to make a classification of the varieties other than by the color of their flesh, which in some is green



Green Citron Melon.

and in others orange or scarlet. The green-fleshed varieties are the most highly esteemed, and among these the most generally cultivated is the green citron, which is somewhat flattened at the ends, 6 in. or more in diameter, deeply and regularly ribbed; skin green, turning yellowish, and thickly netted; the flesh green, thick, and juicy, and of a highly sugary and rich flavor. This in some of its forms is the great market melon, of which immense quantities are sent from the south early in the season, and later from the market gardens near cities; by selection it has been increased in size, and specimens a foot or more in diameter are sometimes seen. The nutmeg is a slightly oval variety, and when pure is highly perfumed and one of the best. Related varieties are the Christiana, valued chiefly for its earliness, Skillman's fine netted, and Ward's nectar,



Large Muskmelon.

all of which are better suited for private gardens than for market. A comparatively recent introduction is the white Japan, a small fruit with a cream-white skin, smooth or slightly netted, and an unusually thick flesh in proportion to its size, and excellent in quality. The

large netted muskmelon is very productive and sweet, but inferior to those already named. There are several varieties known as Persian melons, which have a remarkably thin rind and extremely tender thick flesh; these require a longer season than the ordinary kinds, and are not so well adapted to northern localities; one of the most successful of these is the Cassaba, which is a great favorite near Philadelphia and southward; the Ispahan is regarded as the finest of all, and the most difficult to cultivate. Some of the Persian melons can be preserved for a long time after they are removed from the vines by suspending them in a warm room; the dumpsha is of this class, and is much cultivated in the south of Europe. The varieties so much cultivated in England under glass are little known in this country. The melon is a most popular fruit, but does not agree with delicate stomachs; and it is the custom with many to eat



Watermelon Vine.

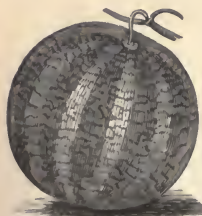
it with the addition of salt and pepper to render it more digestible.—The watermelon (*citrullus vulgaris*) is of Asiatic, or as some say of African origin, and is believed to be the melon referred to in Numbers xi. 5. It is largely cultivated in all warm countries, and presents almost as many varieties as the muskmelon. The vine is a rampant runner, extending from 10 to 18 ft.; the leaves are deeply three- to five-lobed, with the divisions themselves lobed, and of a bluish green; the tendrils are two- or three-forked; both kinds of flowers are solitary in the axils of the leaves, and pale yellow; fruit with a smooth rind, roundish or oblong, of a uniform green or variegated with several shades of that color; in ripening the placentæ in which the seeds are imbedded, as well as the pericarp proper, become fleshy and edible; the seeds are white, brown, or black. The cultivation of the watermelon is essentially the same as that of the

muskmelon, except that the hills are made further apart; the young plants are less liable to the attacks of insects than those of the ordinary melon. The variety first seen in the northern markets is the Carolina or mountain sprout, of which large quantities are brought each season



Carolina Watermelon.

from the southern states; it is large, elongated, and often enlarged toward the blossom end; the skin is dark green, variegated with longitudinal mottled stripes of lighter color or white; the red flesh is of fair quality, and the seeds are black. One of the best varieties is the ice-cream, which when pure is nearly round, pale green, with white flesh and seeds; this is one of the earliest varieties and best suited to northern localities. The black Spanish is one of the sweetest of all, and has a flesh of the darkest red; it is somewhat oblong, slightly ribbed, with a skin of dark blackish green. Joe Johnston and Souter are popular southern varieties. The orange watermelon is remarkable for its keeping qualities, as well as for the readiness with which the flesh parts from the rind. The apple-seeded, so called from the size, shape, and color of its seeds, is another long-keeping kind. New varieties are added to the list each year, and old ones are dropped. The seeds of the watermelon have been used, together with those of the cucumber and other *cucurbitaceæ*, in the form of an emulsion, for diseases of the urinary organs. A few years ago a company was formed in California for the purpose of making sugar from watermelons, but apparently without practical results.



Citron Watermelon.

—The citron watermelon is small, nearly spherical, handsomely marbled with different shades of green, with a white, solid, tough, and seedy flesh, which is quite unpalatable. This is exclusively used for making sweetmeats; the flesh is cut into convenient pieces, often into fancy shapes, and cooked in sirup, becoming semi-transparent; the preserve has a slight but peculiar and distinct flavor of its own; it is often prepared with fresh ginger in imitation of the imported preserved ginger.

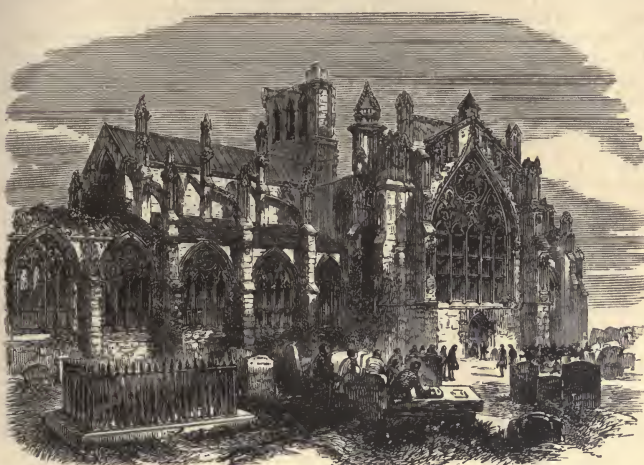
MELOS (the ancient name, now restored), or **Milo**, an island in the Grecian archipelago, one of the Cyclades, belonging to the kingdom of Greece, lying about 65 m. E. of the coast of the Peloponnesus, in lat. 36° 40' N., lon. 24° 23' E.; length 13 m., greatest breadth 8 m.; area, 65 sq. m.; pop. about 3,500. On the N. coast is a deep bay which forms one of the best harbors in the Levant, and on this was once the flourishing town of Melos. The island is of volcanic origin, and is rugged and mountainous, and in parts naked and sterile. Mt. Calamos is still a semi-active volcano, emitting smoke and sulphurous vapors; and hot springs and mines of sulphur and alum are found in various places. Mt. St. Elias, in the S. W. part, is 2,538 ft. above the sea. The valleys and low grounds are very fertile, and when cultivated produce corn, wine, oil, cotton, and fruits in abundance; but the lowlands are malarious and the water brackish, and the island is now almost depopulated. Extensive ruins mark the site of ancient Melos. It is overlooked by Castron, a village on a rocky height above the N. entrance of the bay, which is now the seat of the local government.—Melos was first colonized by the Phenicians, and afterward by the Lacedæmonians. It was rich and populous, but was ruined by the Peloponnesian war, during which the capital was captured by the Athenians, its adult males were put to death, and its women and children carried off as slaves, 416 B. C. The principal relics of antiquity are tombs and subterranean vaults, some of which contain 15 or more sarcophagi. The celebrated statue of the Venus of Milo was found in 1820 in the vicinity of Melos, together with three statues of Hermes.—Anti-Melos, a small mountainous island 6 m. N. W. of Melos, is uninhabited save by wild goats. With this and some other islands, Melos forms an eparchy of the Cyclades.

MELPOMENE, in Greek mythology, the muse who presided over tragedy. She was a daughter of Zeus and Mnemosyne, and is generally represented as a young woman of grave countenance, arrayed in splendid garments, wearing the cothurnus, with a wreath of vine leaves on her head, a sword or the club of Hercules in one hand, and a crown or sceptre in the other.

MELROSE ABBEY, a celebrated ruin in the town of Melrose, Roxburghshire, Scotland, near the Tweed, 31 m. S. E. of Edinburgh. It was founded in 1136 by David I., completed in 1146, and dedicated to the Virgin Mary. The first occupants were Cistercian monks from Yorkshire, England. In 1322 it was destroyed by the English army of Edward II., but was soon rebuilt by Robert Bruce substantially after the present design, and in a style of magnificence which ranks it among the most perfect ecclesiastical structures of the best age of Gothic architecture. In 1385 and again in 1545 it suffered severely at the hands of English armies; and during the reformation its choicest sculptures were mutilated.

In later times it has been despoiled of many of its stones to furnish materials for other buildings; yet at the end of five centuries the

Normans, and on several occasions by the English, who were finally expelled. At the beginning of the 12th century Abélard, though very young, opened a school of philosophy in this town, which was at that time a favorite resort of the French court.



Melrose Abbey.

church, which is the only part of the ancient monastery remaining, is one of the best preserved specimens of Gothic architecture.

MELTON-MOWBRAY, a town of Leicestershire, England, on the Midland railway, 15 m. N. E. of Leicester; pop. in 1871, 5,033. It has much improved of late years, and the parish church was thoroughly restored in 1867. There are a Roman Catholic and various Protestant chapels, a mechanics' institute, two large free schools, and several charitable institutions. Stilton cheese and pork pies are largely produced; and there are manufactures of bobbinet lace, breweries, and tanneries. The Melton hunt attracts hither many sporting men.

MELUN (anc. *Melodunum*), a town of France, capital of the department of Seine-et-Marne, on the Seine, 25 m. S. E. of Paris; pop. in 1866, 11,408. Part of the town is built on an island in the Seine. The most important portion, on the right bank, rises in the form of an amphitheatre, and contains a large square and several fine promenades. The church of Notre Dame has two Romanesque towers, and that of St. Aspais is a lofty edifice of the 15th century, with double aisles, an elaborate vault, and some fine painted glass windows. The central prison is adapted for 1,200 persons; the prefecture occupies an ancient Benedictine abbey; and there are a communal college, a primary normal school, and a public library. Cloth, woollen, and cotton goods, earthenware, and other articles are manufactured. In the neighborhood, which is remarkable for its fine scenery, is Fouquet's château of Vaux-Praslin, where the brilliant financier was arrested in the midst of a fête which he gave in honor of Louis XIV.—The town was besieged by the

versaries of his age, and in the establishment of Presbyterianism in Scotland. Toward the close of 1580 he was made principal of St. Mary's college in the university of St. Andrews, and lecturer on theology and the oriental languages. In 1582 Melville opened an extraordinary meeting of the Presbyterian general assembly with a sermon, in which he vigorously opposed the absolute authority assumed by the court in ecclesiastical affairs. He assisted in drawing up the remonstrance against the policy of the court, subsequently presented to the king at Perth by a deputation of which he was the head. The earl of Arran, one of the council, being irritated at the bold tone of this document, asked fiercely: "Who dares subscribe these treasonable articles?" "We dare," replied Melville, and immediately seizing a pen, affixed his name to it. This was imitated by all his colleagues, and the council suffered them to depart uncensured. But within two years Melville was summoned before the privy council on a charge of treason for words uttered in the pulpit, and Arran exerted himself for his conviction. The accusation could not be proved, and he was sentenced to imprisonment on the charge of irreverence toward the council; but he escaped to London, and returned to Scotland, on the fall of Arran, in November, 1585. In 1587, 1589, and 1594 he was chosen moderator of the general assembly; in 1590 he became rector of the university; and in 1595 he delivered at the coronation of the queen a Latin poem entitled *Stephaniskion*, which, being printed at the solicitation of James VI., was read with admiration throughout Europe. He was accustomed to address the king with the utmost plainness

upon his foibles and vanity; and being a member of a commission appointed in 1596 to remonstrate with regard to certain measures inimical to religion, he chided James so severely as to excite him to great anger, but finally subdued him and obtained every concession demanded. James after his accession to the English throne continued his efforts to obtain control of the Scottish church, in which he had hitherto been thwarted in great part by Melville. In May, 1606, he and other leading Presbyterians were summoned to London under pretence of being consulted by the king upon Scotch ecclesiastical affairs. They obeyed, but soon discovered that they were not free agents; and Melville, for having indited a Latin epigram expressive of his contempt for certain ceremonies he had witnessed at the royal chapel, was brought before the privy council, found guilty of *scandalum magnatum*, and committed to the tower, where he remained till 1611, when, at the solicitation of the duke de Bouillon, he was liberated on condition that he should expatriate himself. Retiring to Sedan, then belonging to the dukes of Bouillon, he was appointed professor of theology at the university of that city. His earliest production was a volume of Latin poems (Basel, 1574). There is a MS. commentary by him on the Epistle of Paul to the Romans, still extant.—See the "Life of Andrew Melville," by Dr. McCrie (2 vols., 1819).

MELVILLE, Herman, an American author, born in New York, Aug. 1, 1819. At the age of 18 he shipped before the mast on a vessel bound for Liverpool, and in 1841 he embarked for the Pacific, as a sailor, on a whaling vessel, in which he cruised for 18 months; but, unable to endure the harsh conduct of the captain, he deserted with a comrade at Nukahiva, one of the Marquesas islands. Losing his way, he wandered into the Typee valley, where the warlike people who take their name from the valley held him four months in an indulgent captivity. At the end of that time he was taken off by a boat from an Australian whaler, which conveyed him to Tahiti. He passed some time in the Society and Sandwich islands, and in 1843 shipped on board the frigate United States at Honolulu, and arrived in Boston in October, 1844. "Typee," a narrative of his adventures in Nukahiva, appeared in 1846 in New York and London, and achieved an immediate success. It was followed in 1847 by "Omoo, a Narrative of Adventures in the South Seas," which recounts his escape from Typee and subsequent voyage. "Mardi and a Voyage Thither," a philosophical romance which was less admired, and "Redburn," founded on the incidents of his first voyage, appeared in the same year. He married in 1847 a daughter of Chief Justice Shaw of Massachusetts, and resided for a few years in New York. He removed to Pittsfield, Mass., in 1850, and afterward returned to New York. His remaining works are: "White Jacket, or

the World in a Man-of-War" (1850); "Moby Dick, or the White Whale" (1851); "Pierre, or the Ambiguities" (1852); "Israel Potter" (1855); "The Piazza Tales" (1856); "The Confidence Man" (1857); and "Battle Pieces and Aspects of the War," a volume of poems (1866).

MELVILLE, Sir James, a Scottish soldier, born at Raith, Fifeshire, about 1535, died at Halhill, in the same county, in November, 1607. At the age of 14 he went to the continent, where he was taken into the service of the constable Montmorency, and made several campaigns in France and Flanders. In 1557 he took part in the battle of St. Quentin, where he was wounded and taken prisoner. In 1559 he went on a secret mission to Scotland, and after the fall of Montmorency he went to Germany and entered the service of the elector palatine, with whose son he visited France in 1561. After his return to Scotland he entered the service of the queen, who sent him twice on a mission to Elizabeth. After the murder of Darnley he remonstrated with her on her partiality for Bothwell, whereupon he lost favor, but nevertheless adhered to her until she was imprisoned in Lochleven castle. On the accession of James he was made a gentleman of the bedchamber and a member of the privy council, and was even pressed by the king to accompany him to London when he went to take possession of the throne of England. He declined this invitation, and devoted his latter days to his "Memoirs of Sir James Melville of Halhill, containing an Impartial Account of the most remarkable Affairs of State during the last Age." The earliest edition is London, 1683; the best, Edinburgh, 1827.

MELVILLE, Lord. See DUNDAS, HENRY and ROBERT.

MELVILLE ISLAND. I. In polar America. See MELVILLE SOUND. **II.** An island lying off the N. W. coast of Australia, between lat. 11° 8' and 11° 56' S., and lon. 130° 20' and 131° 34' E.; area, about 1,800 sq. m. It is separated from the mainland on the east by Dundas strait, which is 15 m. wide, and on the south by Clarence strait and Van Diemen's gulf; while on the west it is severed from Bathurst island by Apsley strait. The N. and W. coast is low, and indented with shallow bays, but elsewhere the coast is high and precipitous. In the centre the island rises from 130 to 200 ft. Vegetation is luxuriant. Several species of eucalyptus are among the most abundant forest trees. The cabbage tree is common, and ginger grows wild. The fauna is identical with that of Australia. Alligators and turtles abound on the coast. The climate from October to May, owing to the great heat and humidity of the atmosphere, is unhealthy, but from May to October it is salubrious. The natives are chiefly hunters, and are more athletic and enterprising than those of Australia.

MELVILLE SOUND, or Parry Sound, a body of water in the north polar regions of America, lying between lat. 72° and 75° N., and lon.

100° and 115° W., enclosed between the Parry islands (Melville, Byam Martin, Bathurst, &c.), on the N., Prince of Wales Land on the S. E., Prince Albert Land on the S. W., and Baring island or Banks Land on the W.; length E. and W. about 300 m.; breadth N. and S. 200 m. Byam Martin channel opens into it on the N.; Banks strait connects it with the Arctic ocean on the N. W.; on the S. an opening discovered by Capt. Allen Young of McClintock's expedition in 1859, and since named McClintock channel, leads between Prince Albert and Victoria Lands and Prince of Wales Land into Victoria channel; and on the E. it communicates through Barrow strait and Lancaster sound with Baffin bay.—**MELVILLE ISLAND**, which lies N. W. of the sound, is irregular in form, and measures about 280 m. from E. to W. and 180 in greatest breadth. Its coast line is broken by several deep gulfs, and it has numerous peninsulas, the chief of which are Sabine and Dundas. It is separated from Bathurst and Byam Martin islands by Byam Martin channel, and from Prince Patrick and Eglinton islands by Fitz William and Kellet straits. The geological formation of its N. part is carboniferous limestone, and of the rest lower carboniferous sandstone with beds of coal.—**MELVILLE PENINSULA** is a projection of the N. coast of the American continent, bounded N. by Fury and Hecla strait, which separates it from Cockburn island, E. by Fox channel, S. by Frozen strait and Rowe's Welcome, and W. by Committee bay, at the head of the gulf of Boothia. It is connected with the mainland by Rae isthmus at the S. W. It lies between lat. 66° 10' and 69° 50' N., and lon. 81° and 87° W., and measures about 280 m. from N. to S. and 150 m. from E. to W.

MEMBERTOU, Henry, a Micmac sagamore and medicine man, born about 1500, died in 1611. He is said to have seen Cartier in his youth; he received De Monts and his colonists, on their arrival in Acadia in 1604, with a friendship that never changed, and by his influence aided them greatly, being the most powerful chief on the coast. He was tall, strongly built, and bearded like a Frenchman. He at once gathered 400 of his tribe in a palisaded village near the French post, and in 1607 led a large Micmac force against the Armouchiquois Indians, near the Merrimack, whom he defeated. Lescarbot commemorated his victory in a French poem. He was hastily baptized, with his wife and three sons and 16 others, June 24, 1610, and seemed to endeavor to live a Christian life, though his excessive zeal led him to wish to make war on all tribes that refused to embrace Christianity. In the autumn of the following year he was brought in a dying condition to Port Royal, and, though carefully attended by the missionaries, soon expired, at the reputed age of 110.

MEMBRANE, a general term applied to thin layers of tissue, more or less elastic, whitish or reddish, lining either closed cavities or canals

opening externally, absorbing or secreting fluids, and enveloping various organs. The simple membranes are either mucous, serous, or fibrous.—The mucous membranes are so called from the peculiar fluid or mucus which they secrete; they line the passages of the body which communicate externally, and by which foreign substances are taken in or the secretions and excrementitious matter carried off; they are continuous with the skin, perform many of its offices internally, and at the points of contact, as in the lips, can hardly be separated by a distinct demarcation. Soft and smooth or velvety, reddish and very vascular, attached to muscle, cartilage, or even peritoneum, their free surface is lined with a layer of epithelial cells covering the vascular parts. They present papillæ upon the tongue, villousities and folds in the alimentary canal, and depressions for glands almost everywhere. The three divisions of the mucous membranes are those lining the digestive, respiratory, and genito-urinary passages. The digestive mucous membrane begins in the mouth, extends through the œsophagus to the stomach, and through the intestinal canal to the anus, sending prolongations into the ducts of the salivary glands, liver, pancreas, and gall bladder. The respiratory mucous membrane lines the nose and the cavities and sinuses connected therewith, the eyelids, middle ear, larynx, trachea, and the bronchial ramifications. The genito-urinary mucous membrane extends externally from the uriniferous tubes of the kidney, and into and through the reproductive organs. In each of these tracts the membranes present some slight modifications adapted for special functions. Mucous membranes are generally endowed with keen sensibility at their points of origin from the skin, as on the lids, lips, &c., but gradually become less sensitive and finally almost insensible, in a healthy state, in the interior of the organs. Besides being the seat of various secretions and absorptions, they assist in the functions of digestion, respiration, and reproduction. (See **EPITHELIUM**, **GLAND**, and **INTESTINE**.)—Serous membranes are formed of fibro-cellular tissue, covered with epithelial cells; they are very thin, smooth, transparent, and extensible, not having the folds, papillæ, and glands of mucous membrane; they are closed sacs, and are found wherever internal organs come in contact with each other, or lie in cavities where more or less motion is required; they consist of two layers, the first surrounding the organ itself, and the second reflected upon the parts with which it is in contact and on which it moves; the cavity is lubricated by a serous fluid, exuded from the surface of the membrane. They are of two kinds: those which line the visceral cavities, as the peritoneum in the abdomen, the pleura and pericardium in the chest, and the arachnoid of the brain and spinal cord; and the synovial membranes, which line the joints, sheaths of tendons and ligaments, and bursæ interposed

between muscles and points of bone over which they glide. They are all shut sacs, except where the Fallopian tubes in most vertebrates open into the abdominal cavity. Serous and synovial membranes by their polished and well lubricated surfaces secure the free movement of contiguous organs, as in the intestines, lungs, and joints; in health their fluid is only sufficient for this purpose, but in a state of inflammation the amount is largely increased, as in the dropsical effusions of peritonitis, pleurisy, pericarditis, hydrocephalus, and synovitis; their sensibility in the normal state is nothing, but in diseased conditions may become acute, as in pleurisy and peritonitis.—Bichat gives the name of fibrous membranes to the aponeuroses of muscles, the capsules of the joints, the sheaths of the tendons, the periosteum, the dura mater of the brain, the sclerotic coat of the eye, &c.; these are never free, but are in contact with and adherent to the parts surrounding, and not moistened by secreted fluid; they are whitish, of a pearly and often shining lustre, and may form sacs, sheaths, or extended layers of thin tissue; possessing elastic and inelastic fibrous tissue, they afford strength to organs, retain the muscles and tendons in place, give the shape to the limbs, favor the movements of the skin and superficial muscles, and assist the venous circulation.—Membranes, especially the serous, may be formed as the accidental products of disease, as in cysts in various parts of the body. False membranes are layers of coagulated fibrine or lymph exuded upon inflamed surfaces, presenting the external form of true membranes, but destitute of organization; under the influence of violent or special inflammations they may endanger life by closing passages, as in the false membrane thrown out in croup. (See LYMPH.) The membranes of the fœtus are alluded to under EMBRYOLOGY, and several other membranes under the names of the organs to which they specially belong.

MEMBRÉ, Zenobius, a Franciscan missionary, born at Bapaume, France, in 1645, killed in Texas about 1687. He was the first novice in the Recollect province of St. Anthony, and was sent to Canada in 1675. Three years later he accompanied La Salle's expedition to the west, remained at Fort Crèvecoeur with Tonty, and aided him in mediating between the Iroquois and Illinois. He subsequently descended the Mississippi with La Salle, and wrote a narrative which was published by his cousin, Father Christian Le Clercq, in his *Établissement de la foi*. He returned to France in 1682, and became warden of a convent at Bapaume. He accompanied La Salle on his expedition to the mouth of the Mississippi, and was left by him in the fort in Texas, where with the rest he was massacred by the Indians. Membré was esteemed for his mildness and virtues. His narrative was claimed by Hennepin, and is by some even at the present time supposed to have been written by La Salle.

MEMEL, the northernmost town of Prussia, in the province of East Prussia, on the Baltic sea near the Russian frontier, at the N. end of the Kurisches Haff, and at the mouth of the river Dange, 72 m. N. N. E. of Königsberg; pop. in 1871, 19,019. It is fortified and well built, has several churches, an excellent naval school, a gymnasium, a high school for girls, and various charitable institutions. The harbor is commodious and safe, and its entrance from 13 to 15 ft. deep. A fort was built on the N. end of the Kurische Nehrung in 1866. A considerable part of the trade between Russia and Germany passes through the town. It is the centre of the Baltic timber trade. The other principal exports are grain, linseed, hemp, flax, hides, and tallow, most of which are received from Russia and Poland. The chief imports are salt, coal, colonial produce, herrings, and manufactured goods. The important manufactures are articles of amber, soap, and brandy. There are iron foundries, chain factories, and about 60 saw mills, and the ship building is considerable.—Memel was built in the middle of the 13th century by the Teutonic knights. In the 17th century it was for some time in the possession of the Swedes, and in 1757 it was taken by the Russians. In 1854 the town was nearly destroyed by fire.

MEMEL RIVER. See NIEMEN.

MEMLING, or **Hemling, Hans**, a Flemish painter, born probably near Bruges about 1425, supposed to have died in Spain in the beginning of the 16th century. He was a pupil of Roger of Bruges, and was one of the best artists of the school of Van Eyck. He visited Italy and Germany in middle life, and is said to have served Charles the Bold of Burgundy in the twofold capacity of painter and soldier. After the battles of Granson and Morat (1476), he gained admittance into the hospital of St. John in Bruges, penniless and disabled by wounds, and painted for the institution some of his finest works. Two of these, altarpieces with wings, are inscribed with his name and the date of the year, 1479. In the chapel of the hospital is also the celebrated reliquary of St. Ursula, a shrine about 4 ft. long, with the history of the saint on the longer sides in six compartments. These pictures are among the most interesting productions of the Flemish school.

MEMMI, Simone, or more properly **SIMONE DI MARTINO**, an Italian painter, born in Siena about 1283, died in Avignon about 1345. He is said to have been a pupil of Giotto, and was one of the first to modify the severity and hardness of the Byzantine manner by imitating the softer style of his master. After the death of the latter he was invited to the papal court at Avignon, where he is said to have painted the portrait of Laura de Sade, on account of which he is mentioned in two of Petrarch's sonnets. At Avignon he also executed a miniature illumination for a manuscript Virgil, once owned by Petrarch and now preserved in the Ambrosian library at Milan.

MEMMINGEN, a walled town of Bavaria, in the district of Swabia and Neuburg, on the Aach, 41 m. S. W. of Augsburg; pop. in 1871, 7,215. It has six churches, a handsome town house, grammar and industrial schools, a hospital, an orphan asylum, manufactures of chintz, calico, wax cloth, ribbons, tobacco, copper, and iron, a bell foundery, bleach fields, and glue works. It was a free imperial city till 1802. Here on Oct. 13, 1805, 4,000 Austrians surrendered to the French under Soult.

MEMMINGER, Charles Gustavus, an American politician, born in Württemberg, Germany, Jan. 7, 1803. His mother, a widow, emigrated to Charleston, S. C., when he was an infant, and soon died. He was placed in an orphan asylum, but at the age of nine was adopted by Gov. Thomas Bennett. He graduated at the South Carolina college in 1820, began to practise law in Charleston in 1825, and was a leader of the Union party during the nullification excitement. He published "The Book of Nullification" (1832-'3), satirizing the advocates of the doctrine in Biblical style. In 1836 he was elected to the legislature, where he opposed the suspension of specie payments by the banks in 1839. He assisted the attorney general in the prosecution of the principal case, which resulted in a decision that the banks had forfeited their charters. For nearly 20 years he was at the head of the finance committee in the lower house of the legislature, from which he retired in 1852. He was again returned in 1854, having become particularly interested in the reformation of the public school system. In 1859 he was a commissioner from South Carolina to Virginia, to secure coöperation against the movements of abolitionists. He was appointed secretary of the treasury of the Confederate States in February, 1861, and resigned in June, 1864.

MEMNON, a hero of the Trojan war, son of Tithonus and Eos or Aurora. Homer in the *Odyssey* describes him as the handsome son of Eos who brought a force of Ethiopians to assist in the defence of Troy against the Greeks. Hesiod calls him king of the Ethiopians. He was slain by Achilles. The Greeks in later ages confounded him with the Egyptian king Amenophis (Amen-hotep) III., whose colossal statue near Thebes excited their wonder by its vocal powers. It is the northernmost of two colossal sitting figures of black stone, in the approach to a temple now ruined, in the quarter of western Thebes called Memnonia by the Greeks. The height of each of these statues is 47 ft., and they rest upon pedestals about 12 ft. high. The upper half of the vocal Memnon was broken off and thrown down, but was afterward restored. On the lower part are 72 inscriptions in Greek and Latin (the earliest being dated A. D. 62), by the emperor Hadrian, the empress Sabina, and by several governors of Egypt and other travellers, official and private, testifying that they have visited the Memnon and heard his voice. The sound is said to

have resembled the twanging of a harp string or the striking of brass, and it occurred at sunrise or soon after. Strabo, who visited it with Ælius Gallus, the governor of Egypt, says he heard the sound, but could "not affirm whether it proceeded from the pedestal or the statue itself, or even from some of those who stood near its base." He does not mention the name of Memnon, and it was not till after his time apparently that the Romans began to suppose the statue to be that of the son of Tithonus. The stone in the lap of the statue, when struck with a hammer, rings with a metallic sound; and as there is a square hole in the body just behind this, it is conjectured that the sound was produced by a person concealed therein. Another theory is that the sound was the effect of the expansion of this stone by the sun's rays, as a similar sound has been thus produced from one of the roof stones of the temple at Karnak.

MEMPHIS, a city, port of delivery, and the capital of Shelby co., Tennessee, situated in the S. W. corner of the state, on the Mississippi river, just below the mouth of Wolf river, on the fourth Chickasaw bluff, 780 m. above New Orleans, 420 m. below St. Louis, and 190 m. S. W. of Nashville; pop. in 1840, 3,360; in 1850, 8,841; in 1860, 22,623; in 1870, 40,226, of whom 15,471 were colored and 6,780 foreigners; in 1874, including suburbs, estimated by local authorities at 65,000. The bluff on which the city is built is about 35 ft. above the highest floods. The streets are broad and regular, and lined with handsome buildings. Many of the residences on the avenues leading from the river are surrounded with beautiful lawns. The city extends over three square miles. In the centre there is a handsome park, filled with trees, and containing a bust of Andrew Jackson. There are two theatres seating 800 and 1,000 persons respectively, and a building for the United States custom house is soon to be commenced. The principal of the six cemeteries is Elmwood, on the S. E. border of the city. Memphis is lighted with gas, is supplied with water on the Holly system, and has about 20 m. of street railways. It is the largest city of Tennessee, and the principal place on the Mississippi between St. Louis and New Orleans, and has a very extensive trade with Arkansas, Mississippi, W. Tennessee, and N. Alabama. Railroad facilities are afforded by the Memphis and Charleston, Mississippi and Tennessee, Louisville and Nashville and Great Southern, Memphis and Little Rock, and Memphis and Raleigh lines, while the Memphis and Paducah railroad is completed for 40 m. The Memphis and Little Rock line terminates at Hopefield on the Arkansas side of the Mississippi, whence a powerful transfer boat conveys an entire train at once to Memphis. Lines of steamers run to St. Louis, Cincinnati, Vicksburg, Napoleon, Ark., and to the Arkansas, White, and St. Francis rivers. The receipts of cotton in 1870-'71 were 511,432 bales; in 1871-'2, 380,938; in

1872-'3, 415,255; in 1873-'4, 429,327. The yearly sales of actual cotton in the Memphis market rank it second in importance in the United States. The annual value of the trade of the city is about \$63,000,000, viz.: cotton, \$32,000,000; groceries and western produce, \$12,500,000; dry goods, clothing, boots and shoes, and miscellaneous merchandise, \$15,000,000; home manufactures, \$3,500,000. The principal manufactories are five large foundries and machine shops, with several smaller ones, extensive wood works, a tobacco factory, a furniture factory, and three of the largest oil mills in the United States, consuming about 500,000 sacks of cotton seed annually, and producing nearly \$1,000,000 worth of cotton-seed oil, oil cake, and reginned cotton. The number of vessels belonging to the port on June 30, 1873, was 32, with an aggregate tonnage of 5,788.

There are 10 banks, with an aggregate paid-up capital of \$2,500,000, and average deposits of \$3,500,000 to \$4,000,000. Ten insurance companies chartered by the state have their headquarters in Memphis, and about 30 companies of other states and countries have agencies there. The city is divided into ten wards, and is governed by a mayor, with a board of aldermen of one member and a common council of two members from each ward. It has an efficient police force and a good fire department. The assessed valuation in 1860 was \$18,212,861; in 1870, \$24,783,190; in 1874, \$29,801,592. The rate of taxation is \$1 80 on \$100, and the city debt amounts to about \$4,000,000. The United States courts for the W. district of Tennessee are held here. The principal charitable institutions are the Leath orphan asylum, St. Peter's orphan asylum, church orphans'



Memphis, Tenn.

home, the colored orphan asylum, and the city hospital. There are 67 public schools, with an average attendance of 2,918 white and 1,565 colored pupils; they are graded, and include a male and a female high school. Four of the Catholic parochial schools are also free, and have a daily attendance of 650 white children. Christian Brothers' college (Roman Catholic), established in 1871, in 1873-'4 had 12 professors and instructors, and 122 preparatory and 37 collegiate students. The Memphis female college is in the city, and the state female college near by. There are 32 private schools and academies. The Memphis library association has 9,000 volumes. Five daily, one tri-weekly, nine weekly (one German) newspapers and two monthly periodicals are published. There are 48 churches, viz.: 11 Baptist (8 colored), 2 Christian (1 colored), 2 Congregational (1 colored), 3 Cumberland Presbyterian, 5 Episco-

pal, 2 Jewish, 1 Lutheran, 12 Methodist (4 Southern and 6 colored), 6 Presbyterian (1 German), and 4 Roman Catholic (1 German).—Memphis was laid out in 1820, and incorporated as a city in 1831. During the civil war, after a naval encounter in which the confederate flotilla was nearly destroyed, the city was taken possession of by the Union forces, June 6, 1862, and was never afterward held by the confederates. In August, 1864, a cavalry raid was made upon it by Gen. Forrest, who entered the town, made several hundred prisoners, and then departed.

MEMPHIS (Coptic, *Menfi* or *Menofre*, "good abode" or "the abode of the good one," supposed to refer to Osiris; in hieroglyphic inscriptions, according to some, *Ma-en-Ptah*, abode of Ptah; in Scripture, *Noph* or *Moph*), an ancient capital of Egypt, on the W. bank of the Nile, 10 m. S. of the modern city of

Cairo. Its foundation is ascribed to Menes, the first king of Egypt; it was certainly very ancient, and was the first capital of the united kingdom of Upper and Lower Egypt. Its situation commanded the S. entrance to the delta, and it was protected by a dike from the inundations of the Nile. According to Diodorus, Memphis was about 17 m. in circuit, but probably this included much open ground. It was remarkable for its fine climate and the beauty of the view from its walls. It controlled the inland trade of Egypt, ascending or descending the Nile. It was the chief seat of learning and of religion, the principal place of the worship of the god Ptah, and the chosen residence of the sacred bull Apis, whose temple here was celebrated for its colonnades through which the great processions were conducted. The other great temples were: that of Isis, commenced at a very early period, and completed by Amasis, 564 B. C.; the temple of Serapis, to which was attached a Nilometer, in the western quarter of the city; the temple of Phra or the sun; and the temple of Ptah, the most ancient of all, and the largest and most superb.—Memphis was the seat of successive dynasties, the 3d, 4th, 5th, 7th, and 8th of Egyptian history, who (according to Mariette) reigned, with one interval of 203 years, from 4449 to 3358 B. C. By the 4th dynasty the great pyramids were built. It was also the capital during the supremacy of the shepherd kings. It suffered severely from the Persians, who avenged the murder of their herald by the Memphians. They made it the headquarters of a Persian garrison; and Cambyzes compelled Psammetik III., the last of the Pharaohs, to kill himself, slew the sacred Apis with his own hand, massacred the priests, and profaned the temple of Ptah. The Persians made it the metropolis of their African possessions, and it continued to be the chief city of Egypt until the foundation of Alexandria, after which it gradually declined, and in the course of ages sunk into such utter decay that its very site, overwhelmed with drifted sand, was a matter of dispute among antiquaries. Modern researches have proved that the village of Mitrahenny or Mitranieh, S. of Gizeh, marks the site of Memphis. Its remains extend over many hundred acres of ground, and include ruins of temples and of palaces, and statues, bass reliefs, and inscriptions, to the number of several thousand.

MEMPHREMAGOG, Lake, a body of water, about 35 m. long from N. to S. and from 2 to 5 m. wide, situated partly in Vermont and partly in Quebec, Canada. It discharges through Magog river into the St. Francis, and thence into the St. Lawrence. The surrounding scenery is picturesque. Along the W. shore are several mountains, prominent among which are Owl's Head, Elephants, and the Sugar Loaf; the E. shore presents a pleasing contrast. The lake is studded with islands, and abounds in fine fish. Near its head is the

village of Newport, and at its outlet Magog, between which a steamer plies in summer, accommodating the numerous visitors.

MÉNAGE, Gilles, a French author, born in Angers, Aug. 15, 1613, died in Paris, July 23, 1692. After practising law for a short time he became a priest, and lived for a while with Cardinal de Retz, but finally established himself in a house in the cloister of Notre Dame, where on Wednesdays he entertained numbers of wits and scholars. His wit and erudition became celebrated; his quarrels, his social relations, and the epigrams and witticisms which they called forth, are prominent in the literary history of the 17th century. He wrote, among other works, *Origines de la langue française* (1650), enlarged and published as *Dictionnaire étymologique de la langue française* (1694); *Poemata Latina, Gallica, Græca et Italica* (1658); and *Anti-Baillet* (1685). After his death his friends published, under the title of *Menagiana*, a collection of his witticisms and table talk. The best edition is that by La Monnoye (2 vols., 1693-'4). The second part of his *Histoire de Sablé* (1st part, 1686) was edited from the manuscript and published by J. B. Haureau in 1873.

MENAI STRAIT, a narrow channel of Wales, which separates the island of Anglesea from Carnarvonshire. Its direction is nearly S. W. and N. E., its length about 13 m., and its breadth from 200 yards to 2 m. The navigation of this strait in some places is difficult and hazardous; but as the passage saves time and distance, vessels of 100 tons, and sometimes larger, pass through it. The first and last portions of each ebb and flow run in contrary directions in this strait, and the tides are very high, at the equinox sometimes rising to 30 ft. The Menai channel is crossed by two bridges about a mile apart, the Menai suspension bridge and the Britannia bridge. (See BRIDGE, vol. iii., pp. 274, 275.)

MENANDER, an Athenian dramatic poet, born in 342 B. C., died in 291. Alexis, the comic poet, was his paternal uncle, Theophrastus his preceptor, and Epicurus his intimate friend. Little is known of his life. His comedies gained him the patronage of Demetrius Phalereus, and of the first Ptolemy, who invited him to his court at Alexandria; this invitation he declined. His intimacy with Demetrius Phalereus involved him in danger after the expulsion of that statesman from Athens by Demetrius Poliorcetes; and he would have been put to death but for the intercession of Telesphorus, son-in-law of the latter. He is said to have been drowned while swimming in the harbor of Piræus. The Athenians raised a monument to his memory beside that of Euripides, and placed his statue in the theatre. Menander was the greatest poet of the new comedy, which he purified from the coarseness and buffoonery of the old. His comedies, which were very numerous, maintained their place on the stage for some centuries, and were models

for both Greeks and Romans. Of his imitators Terence was the most unscrupulous, his plays being almost entirely translations or aggregations of those of his Hellenic master. The *editio princeps* of the fragments of Menander is that of Morellius (Paris, 1553); the best edition is that of Meineke in his *Fragmenta Comicorum Græcorum* (Berlin, 1841).—See Benoit, *Essai historique et littéraire sur la comédie de Ménandre* (Paris, 1854), and Guillaume Guizot, *Ménandre, étude historique et littéraire* (1855).

MENARD. I. A W. county of Texas, intersected by San Saba river; area, 870 sq. m.; pop. in 1870, 667, of whom 372 were colored. The soil is fertile, and there is fine water power. Silver mines are known to exist. In 1870 there were 17,876 cattle. Capital, Menardville. II. A central county of Illinois, bounded N. partly by the Sangamon river, which intersects it; area, 302 sq. m.; pop. in 1870, 11,735. It has a level surface and productive soil. The Jacksonville division of the Chicago and Alton railroad passes through it. The chief productions in 1870 were 81,945 bushels of wheat, 1,973,880 of Indian corn, 235,091 of oats, 41,456 of potatoes, 37,551 lbs. of wool, 237,575 of butter, and 13,323 tons of hay. There were 6,840 horses, 3,341 milch cows, 10,032 other cattle, 11,113 sheep, and 26,942 swine; 7 manufactories of carriages, 8 of brick, 6 of furniture, 5 of saddlery and harness, 1 of woollen goods, 4 flour mills, and 5 saw mills. Capital, Petersburg.

MENARD, René, a French missionary, born in Paris in 1604, died near Lake Superior in August, 1661. He entered the society of Jesus in 1624, and was the spiritual guide of the Dailleboust family, prominent in the settlement of Montreal. Menard himself went thither in 1640. He was soon after sent to the Nipissings in Upper Canada; after laboring among them and other Algonquin tribes till the Iroquois completely overthrew the Hurons, he was stationed at Three Rivers. When a mission was begun among the Iroquois, he was sent to Cayuga in 1656, and subsequently to Oneida, and labored with success, though at the risk of his life, and often subjected to personal violence. After the breaking up of the Iroquois missions in 1658 and 1660, he was sent to the Ottawas on Lake Superior to begin a mission in the far west. He suffered greatly from the brutality of the Indians, but reached their country and began a mission at St. Teresa's on Keweenaw bay. In the summer of 1661 he yielded to the appeal of some fugitive Hurons on the Black river, and while toiling to reach them was lost or cut off by Indians.

MENASSEH BEN ISRAEL (properly MANASSEH BEN JOSEPH BEN ISRAEL), a Jewish rabbi, born in Portugal about 1604, died in Middelburg, Zealand, Nov. 20, 1657. His father fled from the inquisition to Holland, and settled at Amsterdam, where the son was placed under the tuition of Rabbi Isaac Uziel. At the age of 18 he succeeded his master in the office of preach-

er and expounder of the Talmud. He established a press in his own house, at which he printed three editions of the Bible, and several rabbinical books in the Hebrew and Spanish languages. When he was 35 years of age the family property was confiscated by the inquisition, and he resorted to commerce to retrieve his fortune. During the protectorate he was favorably received by Cromwell, before whom he pleaded for the readmission of his coreligionists into England, writing for that purpose his "Defence of the Jews" (London, 1656). He was the author of *El conciliador del Pentateuco* (Amsterdam, 1632); *Spez Israelis*, in Latin and Spanish (London, 1650); and other works in Hebrew, Portuguese, and Spanish. His "Defence of the Jews" was translated into German by Mendelssohn. His life has been written by the Rev. Thomas Pococke (1709).

MENCIS, Meng-tse, or Mang-tse. See CHINA, vol. iv., p. 473.

MENDEANS. See CHRISTIANS OF ST. JOHN.

MENDANA ISLANDS. See MARQUESAS.

MENDELSSOHN, Moses, a German philosopher, born in Dessau, Sept. 6, 1729, died Jan. 4, 1786. His father was a Jewish transcriber of the Pentateuch and master of a Hebrew day school. He was early sent to the public Talmud school, where he was taught the Mishnah and Gemara, and at the age of seven was usually called up at 3 or 4 o'clock in the morning to proceed to the severe tasks of the school. Even at that age he manifested a spirit of thorough inquiry, and mastered the Hebrew language, so that he could write it with purity and elegance. He subsequently conceived an enthusiastic love for the "Guide of the Perplexed" (*Moreh nebukhim*) of Maimonides, and his severe study of it laid the foundation at once of his mental culture and of a chronic nervous disease. About 1745 he followed his friend and teacher Rabbi Fränkel to Berlin, and he lived there several years in extreme poverty. He became intimate with the mathematician Israel Moses, under whom he studied Euclid in a Hebrew translation, and with whom he discussed what he read in Latin and German. Through other friends he obtained elementary instruction in the French and English languages. It had been his custom whenever he purchased a loaf to notch it according to his pecuniary prospects into so many meals, never eating according to his appetite, but to his finances. In 1750 he became acquainted with an opulent Jewish manufacturer named Bernhard, and was admitted into his family at first as tutor to his children. In 1754 he became his bookkeeper. He now made the acquaintance of Lessing, and the latter pages of the *Morgenstunden* record their enduring mutual affection. Their recognized intimacy, and the accession of Nicolai and Abbt to the circle, contributed much to overthrow the *Judæophobia* then so prevalent in Germany. In 1755 he published a treatise *Ueber die Empfindungen*, a profound disquisition on problems of æsthetics.

This was followed by other short treatises, which were collected under the title of *Philosophische Schriften* (Berlin, 1761). He was one of the most active contributors to the *Bibliothek der schönen Wissenschaften*, and to the *Briefe, die neueste Literatur betreffend*. In 1763 the royal academy of Berlin awarded him the prize for a memoir on the question: "Are metaphysics susceptible of mathematical demonstration?" though Kant was one of his competitors. The death of his first child in the same year was the occasion of his defending Spalding against Abbt in their controversy on human destiny; and subsequently, imitating Plato's "Phædo," and adding all the arguments for the immortality of the soul suggested by the philosophy of later periods, he produced his *Phædon, oder über die Unsterblichkeit der Seele* (Berlin, 1767), which was soon translated into almost all European languages, as well as into Hebrew. Mendelssohn's fame was at its height when he received a public challenge from Lavater either to refute Bonnet's arguments in support of Christianity or to renounce Judaism. He answered the challenge with an adroitness and candor that drew from Lavater an apology and retraction of his peremptory address. The agitation caused by this matter induced a long and dangerous illness. Mendelssohn exerted an immense influence by his efforts for the elevation of his coreligionists. His German translation of the Pentateuch and metrical version of the Psalms are admirable for elegance and perspicuity; and their publication, accompanied by Scriptural comments in Hebrew by himself and a circle of friends, marks an epoch in the history of modern Judaism. In defence of the rights of his Jewish brethren he wrote the introduction to his translation of Rabbi Menasseh ben Israel's "Defence of the Jews" (Berlin, 1782). In 1783 appeared his *Jerusalem, oder über religiöse Macht und Judenthum*, a vindication both of religious tolerance and of Judaism, and still one of the best books on those topics. He published in 1785 *Morgenstunden*, consisting of lectures on the existence of God. It contains an affectionate memorial of Lessing, and was the occasion of Jacobi's letters to him *Ueber die Lehre des Spinoza*, in which Lessing was charged with being a Spinozist. Mendelssohn immediately answered in a dissertation addressed *An die Freunde Lessings*. His health was seriously injured by the excitement attending this effort, and a slight cold terminated fatally. The most complete edition of his works appeared under the care of his grandson G. B. Mendelssohn (7 vols., Leipsic, 1843-'56). His life has been written, among others, by Samuels (2d ed., London, 1822) and Kayserling (Berlin, 1862).

MEDELSSOHN-BARTHOLDY, Felix, a German composer, born in Hamburg, Feb. 3, 1809, died in Leipsic, Nov. 4, 1847. He was a grandson of Moses Mendelssohn. His father, Abraham Mendelssohn, had added the name of Bartholdy

to his own, out of regard to his wife, a lady of the Bartholdy family. He became a convert to Christianity, and Felix was brought up in the Lutheran faith in Berlin, where his father had founded with his brother Joseph the banking firm of Mendelssohn and co., still continued by the brothers of Felix. Goethe was foremost among the many distinguished persons who became interested in his precocious genius. He was not six years old when he displayed his skill on the piano. Zelter became his instructor in composition, the concert master Hemming on the violin, and Ludwig Berger on the piano. In his ninth year he gave his first public concert in Berlin, and a year afterward he gave one in Paris. From that time he began to write compositions for the piano, violin, viola, and violoncello; and three of his quartets published in 1824 still hold a place among classical musical works. In 1825 he made a second journey to Paris with his father, who at length determined to let his son devote himself exclusively to music. He gave successful concerts in Paris in company with Baillot, and after his return to Berlin produced in 1827 his first opera, *Die Hochzeit des Gamacho*, in which the principal characters of Cervantes's "Don Quixote" are introduced. But the music met with a cold reception, and the opera was immediately withdrawn. He now travelled several years in England, France, and Italy. His overture to Shakespeare's "Midsummer Night's Dream," composed in 1826, was received with unbounded admiration. The rest of the music for that play was written by him afterward as an accompaniment to its performance. He spent some time in Edinburgh, and immortalized the popular music of the Scotch bagpipers by his symphony in A minor, since called the Scottish symphony, which was first performed under his own direction by the London philharmonic society. Many other reminiscences of his tour through the highlands are to be found in his compositions and his orchestral pieces. His overture *Die Hebriden* reproduces the impressions which the wild shores of the Hebrides had made upon him. He endeavored to establish, in concert with Immermann, musical and dramatic entertainments at Düsseldorf, to consist solely of the most select productions. This enterprise failed, but increased his reputation as a conscientious artist. His residence at Berlin was embittered by the intrigues of his opponents, and in 1835 he accepted the directorship of the famous Leipsic Gewandhaus concerts, which under his care attained to an unprecedented degree of perfection. He was more appreciated in England than in his own country, chiefly on account of his compositions of sacred music. His oratorio "St. Paul," after being produced at Düsseldorf and Leipsic, was performed under his own direction at the Birmingham festival of Sept. 20, 1837, where it was received with great enthusiasm. His fame rests in a great measure upon this oratorio and upon that of "Elijah," which was written for

the Birmingham festival, the first performance taking place there Aug. 26, 1846. Mendelssohn had been engaged for nine years upon this composition, and had resigned the post of inspector of music in Berlin in order to superintend its performance in England; and shortly before his death he was again in London to attend the sacred harmonic society's concert at Exeter Hall. He had resumed his place at Leipsic since 1845; and shortly after his return there from his visit to England in 1847, his health was impaired by grief at the sudden death of his beloved sister Fanny Hensel. A tour to Switzerland for the recovery of his strength brought only temporary relief; a relapse took place soon after his return to Leipsic, and he died in the prime of his manhood from an affection of the brain. Many of his posthumous compositions have been published, including a fragment of an oratorio entitled "Christus," some scenes of "Loreley," a romantic opera, the trumpet overture, the 8th book of his "Songs without Words," and the "Reformation" symphony. Among the most famous of his many published works are his music for Goethe's "Walpurgis Night," the "Antigone" and "Œdipus" of Sophocles, and Racine's *Athalie*, organ compositions, his symphonies, and a great number of admirable sonatas, concertos, trios, &c. In his "Songs without Words" for the pianoforte, Mendelssohn opened a new vein of beauty, and produced an indispensable work for pianists by throwing aside language and replacing it with musical sentiment, at the same time keeping in view the scope and character of the instrument, and inventing charming traits of accompaniment. Mendelssohn's appreciation of dramatic effect, so remarkably displayed in his music to the "Midsummer Night's Dream," led his friends to expect from him important contributions to the lyrical drama; but his admiration for Bach and Handel and the difficulty that his fastidious taste found in obtaining a satisfactory libretto led him to devote himself to other branches of musical composition. In his oratorios he had the tact to write dramatically, and with freedom from too constant a use of fugue and from antiquated formalisms. Mendelssohn was as much beloved for the beauty of his character as for his genius. His life was comparatively free from struggles and cares, and from his earliest childhood he was permitted to indulge his tastes without hindrance. He devoted himself exclusively to his profession, with severe study and a serene and dispassionate mind.—His life has been written by W. A. Lampadius (Leipsic, 1848; English translation, New York, 1865). See also "Recollections of F. Mendelssohn-Bartholdy," by Edward Devrient (English translation, London, 1869); *Goethe und Mendelssohn*, by Karl Mendelssohn (English translation, London, 1872); and *Mendelssohn-Bartholdy, Briefe und Erinnerungen*, by Ferdinand Hiller (Cologne, 1874; English translation, London, 1874).

MENDES, a city of ancient Egypt, situated in the delta, near the point where the Mendesian arm of the Nile flows into the lake of Tanis. It was a considerable place under the Pharaohs, was one of the homes assigned to that division of the native army called by Herodotus Calasiries, and was celebrated for the manufacture of a perfume known as the *Mendesium unguentum*. It was in ruins in the first century B. C.; its remains are seen in the mounds of Ashmoun on the canal leading to Menzaleh. It was the seat of the worship of a deity represented under the form of a goat, whom the Greek writers on Egypt call Pan, but who was probably Khem, one of the great gods of Egypt, and the symbol of the generative principle.

MENDEZ PINTO, Fernam, a Portuguese adventurer, born near Coimbra about 1510, died near Lisbon, July 8, 1583. At an early age he went to the East Indies, and in 1537 embarked as a volunteer against the Turks in the Indian ocean and Red sea. After various adventures he was captured by the Turks near the strait of Babel-Mandeb, carried to Mocha, sold as a slave, and ransomed by the Portuguese governor of Ormuz, who furnished him with the means of returning to India. He was afterward employed in several expeditions, was again enslaved and ransomed, and was involved in shipwrecks and conflicts with pirates. In May, 1542, he and some other Portuguese were persuaded by a Chinese pirate to undertake an expedition to the island of Calempui, not far from Peking, where, as they were led to believe, were the tombs of 17 Chinese kings, containing vast treasures. Their attempt to plunder these tombs was only partially successful, and they fled terrified at the alarm raised by the guardians of the treasures. Shortly afterward they were again shipwrecked on the Chinese coast. Pinto with a few others got on shore; but they were apprehended as thieves and set to work in repairing the great wall. In a few months they were delivered by an inroad of Tartars, who carried them to assist in the siege of Peking, and then took them to Tartary. After a short residence in that country Pinto went in the train of an ambassador to Cochinchina, and from there made his way to Macao. Here he enlisted in the service of a Chinese pirate, whose vessel was driven by a gale to the coast of Japan, which had not then been visited by Europeans. Pinto was well received by the Japanese, and after a considerable stay in their country he sailed back to Ningpo (then called Liampo) with the Chinese pirate. His report of the discovery of Japan and its great wealth and magnificence created such an excitement among the Portuguese at Ningpo, that in 15 days nine hastily equipped ships were despatched for the new Eldorado. Eight of them foundered, and the one in which Pinto sailed was driven to the Loo Choo islands, then first seen by Europeans, and wrecked there. After many fresh adventures Pinto found his way back to China. He

next visited Pegu, Siam, Java, and some of the neighboring countries, and in 1547 he made a second voyage to Japan. Soon after his arrival there a civil war broke out, in which Pinto took part for a while; and having returned to Malacca, he met St. Francis Xavier, "the apostle of the Indies," with whom in the course of a few months he made a third visit to Japan, arriving there in August, 1548. By these voyages Pinto acquired great wealth, and in 1553 he was at Goa, preparing to return to Portugal, when the arrival there of the body of Xavier, and his conferences with the Jesuits, so excited his religious enthusiasm, that he devoted his whole fortune, except 2,000 crowns which he sent to his poor relations in Portugal, to the foundation of a seminary for propagating the faith in Japan. He was then appointed ambassador from the Portuguese viceroy of India to the prince of Bungo in Japan. Before setting out he took the vows as a Jesuit; but on his arrival in Japan his zeal evaporated, and he was released from his vows. He returned to Lisbon, where he arrived Sept. 22, 1558, bearing to the queen regent a letter from the viceroy at Goa, recommending him warmly to the favor of the government. He spent a few years in attendance on the court, which brought him nothing but promises, and which he says were more tedious and harassing than his 21 years of service in the East, where he had been 13 times taken by the enemy, and 17 times sold as a slave. The first extant account of his travels and adventures is given in a collection of Jesuits' letters published in Italian at Venice in 1565. He wrote a full narrative of his life, which was published by Francisco de Andrada under the title of *Peregrinação de Fernam Mendez Pinto* (4to, Lisbon, 1614). A Spanish translation by Francisco de Herrera, in which great liberties were taken with the original, appeared in 1620; a French translation was made by Bernard Figuier, of which three editions have been printed (Paris, 1628, 1645, and 1830), and an English translation by H. Cogan, of which there have been two editions (London, 1663 and 1692). Pinto's reputation has suffered greatly by an oft quoted line in Congreve's "Love for Love": "Ferdinand Mendez Pinto was but a type of thee, thou liar of the first magnitude!" But it is now admitted that his general veracity cannot be disputed.

MENDICANTS, or Begging Friars. See RELIGIOUS ORDERS.

MENDIZABAL, Juan Alvarez y, a Spanish financier, born in Cadiz about 1790, died in Madrid, Nov. 3, 1853. He was the son of a trader of Jewish descent named Mendez, and in 1808 obtained employment in the victualling department of the French army in Spain. In 1819 he took part in the secret movements which culminated in the revolution of the following year, and subsequently aided the constitutional government in the negotiation of loans. Fleeing to England on the suppression of the rev-

olution, he was imprisoned at the instance of English capitalists whom he had induced to take parts of a loan. After the recovery of his liberty he founded in London a commercial establishment with the aid of funds deposited with him by a friend. He formed the acquaintance of an agent of Dom Pedro of Portugal, and in 1827 negotiated a loan for him. This and other operations gave him an extensive reputation both in England and Spain, which in June, 1835, led to his appointment as minister of finance in the cabinet of Toreno; but he continued to reside in London, where in August he negotiated a loan for the Spanish government. On his return to Madrid he became president of the council. The cortes placed 100,000 men at his disposal, and gave him full authority to bring the civil war to a close. But he injured the credit of the government by jobbing transactions, increased the public debt, dissolved the cortes (Jan. 27, 1836), insulted the French ambassador, who opposed his influence, and was compelled to resign (May 15). His reappointment as minister of finance (Sept. 11) caused great indignation, and on Aug. 10, 1837, he withdrew from office. In 1841, under Espartero, he was once more minister of finance, but shared his fall in July, 1848. He afterward lived in great splendor for several years in Paris.

MENDOCINO, a N. W. county of California, bordering on the Pacific, and drained by the head waters of Eel and Russian rivers, and by numerous other streams; area, 3,816 sq. m.; pop. in 1870, 7,545, of whom 129 were Chinese. The interior is mountainous, but generally adapted to agriculture or grazing. Along the coast the mountain sides are covered with forests of redwood. The chief productions in 1870 were 95,639 bushels of wheat, 129,971 of oats, 64,670 of barley, 83,473 of potatoes, 178,498 lbs. of wool, 62,692 of butter, 59,400 of hops, and 10,116 tons of hay. There were 4,405 horses, 3,431 milch cows, 7,906 other cattle, 49,839 sheep, and 18,109 swine; 2 flour mills, 15 saw mills, and 6 manufactories of saddlery and harness. Capital, Ukiah.

MENDOZA. 1. A S. W. province of the Argentine Republic, bounded N. by San Juan, E. by San Luis, S. by the unsettled districts W. of Buenos Ayres, and W. by Chili, from which it is separated by the Andes; area, 65,000 sq. m.; pop. in 1869, including inhabitants of foreign birth, 65,413. The entire western portion of the province is mountainous, being covered by the main chain and detached spurs of the Andes; while to the east is a ridge extending southward from the province of San Juan and forming the dividing line with San Luis, being a continuation of the Famatina mountains of La Rioja. In the vicinity of the capital rises the Paramillos chain, whose maximum elevation is about 10,000 ft., and near these lies the lofty valley of Upsallata, with a mean elevation of 6,000 ft. Among the peaks skirting this part of the republic

are some of the highest in the Andes, including Aconcagua, the culminating point of America; and at the extreme south are the Nevada and Payen systems, the former attaining to a height of 15,000 ft. Nearly all the mountains here referred to are volcanoes, some of which are in continual eruption. The principal rivers are the Mendoza and the Tunuyan, the first descending from Aconcagua, and each forming several lagoons from which extend natural canals very useful for irrigation. Agates, amethysts, carnelians, and sapphires are found. Several gold mines were formerly worked; in the Uspallata valley are mines of argentiferous lead; copper, iron, lime, chalk, pumice stone, coal, pitch, petroleum, and beautiful marbles are very abundant. Mineral springs are common in the west; and there are thermal springs celebrated for their medicinal properties, and for a copious yield of boracic acid. The climate is salubrious, and the soil is generally fertile, save in the south, where it is naturally sterile, but improved by irrigation and manuring. The chief products of the forests are white and black poplar; cereals of all kinds are abundant, as are also the grape and a great variety of other fruits; and cotton, tobacco, and hemp grow well. Cotton and woollen stuffs are manufactured, and several sorts of fruit are preserved; but there is great lack of means of transport to the sea. Most of the products are sent across the Andes by the paso del Portillo into Chili. There are numerous schools; but of 17,216 children between 6 and 14 years in 1869, only 2,132 attended school; and 55,395 persons out of the whole population could neither read nor write. Mendoza is divided into twelve departments. It formed a part of the captaincy general of Chili till 1776, when it was annexed to the viceroyalty of La Plata. **II.** A city, capital of the province, 610 m. W. N. W. of Buenos Ayres; pop. in 1869, 8,124. It is surrounded by several canals, one of which traverses the town, and the banks of all of which are fringed with poplars. Every available spot of land in the vicinity is highly cultivated. The chief occupations are agriculture, wine making, and fruit preserving. It was almost totally destroyed by an earthquake in 1861, but is in rapid course of reconstruction. In 1776 Mendoza was made the seat of government of the viceroyalty of La Plata.

MENDOZA, a family of Spain, several of whose members have been distinguished. **I. Inigo Lopez de**, marquis de Santillana, born at Carrion de los Condes in 1398, died in Guadalajara, March 26, 1458. He inherited vast estates from his father, the grand admiral of Castile. He was successful against the Aragonese in the battle of Araviana and the defence of Alcalá, and as commander of the army sent against the Moors, whom he repeatedly overthrew; for all which exploits he obtained the titles of count and marquis. He afterward went to court, and took part in the internecine struggles of the kingdom. He cultivated letters, and was

the friend and protector of the learned of his time. The peculiarly Italian form of the sonnet was introduced by him into Spain. His chief production is the *Comedieta de Ponza*, founded on the story of a naval combat near the island of Ponza in 1435; his most popular is the *Refranes*, "Proverbs," sometimes called the *Centiloquio*, as it comprises 100 rhymed sentences. His other productions embrace sonnets, a *Canto fúnebre* on the death of Enrique de Villena, critical and historical dissertations, and poems. **II. Pedro Gonzales de**, son of the preceding, born in Castile in May, 1428, died in Guadalajara, Jan. 11, 1495. Before 1473 he was archbishop of Seville, and in that year he became cardinal of Spain. He distinguished himself in the battle of Toro, March 1, 1476, and shortly afterward accompanied Queen Isabella to put down the rebellion at Segovia. In 1479 he showed much favor to the persecuted Jews. He was translated to the archbishopric of Toledo in 1482, and appointed grand guardian of the Alhambra in 1492. From his great influence at the court of Ferdinand and Isabella, he was usually called *rex tertius*, "the third king." **III. Diego Hurtado de**, son of the count Tendilla, and grandnephew of the marquis de Santillana, born in Granada about 1503, died in Madrid in April, 1575. He was educated at the university of Salamanca, and learned Arabic at Granada, where he wrote his *Lazarillo de Tormes* (Antwerp and Burgos, 1554). This is a satirical romance, and became the foundation for the whole class of Spanish fictions in the *género picaresco*, which the *Gil Blas* of Le Sage subsequently made famous throughout Europe. The *Lazarillo* was attributed by a conscientious authority to José de Sigüenza. (See Nicolas Antonio's *Bibliotheca Nova*, vol. i., p. 291.) A Paris edition was published in 1620, and a French translation (including a second part from another pen, very inferior to Mendoza's) in the same year. The first part was prohibited by the inquisition. After leaving the university he served in the Spanish armies in Italy, where he profited by the teaching of the professors at Bologna, Padua, and Rome. Charles V. sent him as ambassador to the republic of Venice in 1538, and there he exerted himself for the collection of Greek manuscripts. He was charged with the imperial interests in the council of Trent, whence he was withdrawn in 1547, to command the Spanish garrison at Siena. Having been expelled from Siena by the inhabitants, he set out immediately as special plenipotentiary to Rome. For six years he was regarded as the head of the imperial party throughout Italy. He returned to Spain when the emperor changed his policy before abdication. Philip II. banished him from court in 1567, and he retired to Granada. Toward the end of 1574 he was permitted to return to Madrid; but he soon died. His poems display the old Castilian national tone of sentiment and reflection, modified by his

familiarity with the classical and Italian poets. His epistle to Boscan and hymn to Espinosa attest at once great genius and vast classical erudition. There is but one edition of his poems (4to, Madrid, 1610). His principal historical work is the *Guerra contra los Moriscos*, a record of the Moorish insurrection. The author is so impartial with respect to the enemies of his faith and people that the book could not be published till long after his death (Valencia, 1776). His life by Antonio is contained in the *Bibliotheca Nova*. **IV. Antonio de**, brother of the preceding, born in Granada about 1495, died in Lima, July 21, 1552. On April 17, 1535, he was appointed viceroy of New Spain, where he arrived in October, invested with full power to act in opposition to previous royal orders. His administration was distinguished by many wise reforms, especially in matters concerning the Indians, whose sufferings were materially alleviated by his efforts. In 1536 he introduced into the city of Mexico the printing press, the first brought to the new world, and the first coining, in the same year, was done by his orders; he also founded the first college there (1537). In 1551 he was transferred to the viceroyalty of Peru. He was the first of a series of 64 viceroys in New Spain, and his administration was the longest and most illustrious of them all.

MENELAUS, one of the Homeric heroes, king of Lacedæmon, son of Atreus and younger brother of Agamemnon, and husband of Helen. After his wife had eloped with Paris, he and Ulysses proceeded to Troy to demand her restitution. In the war which followed the refusal he repeatedly distinguished himself, slaying many Trojans in single combat. He also engaged Paris, and would have killed him had not Venus interfered and enabled her favorite to escape. Menelaus was one of the warriors concealed in the famous wooden horse. On recovering Helen he embarked for home; but when he arrived off Cape Malea Jupiter sent a storm which scattered his fleet, and drove his ship as far as Egypt. With the exception of Ulysses, he was the last of the Hellenic heroes that reached Greece. He is said to have been the father of several children by Helen.

MENENDEZ DE AVILES, Pedro, a Spanish admiral, colonizer of Florida, born at Aviles in 1519, died in Santander, Sept. 17, 1574. He cruised for many years against French corsairs, on his own account and under commission from Charles V., with great success. Philip II. appointed him captain general of the India fleets, and his councillor. He conveyed Philip from Corunna to England to marry Queen Mary. Returning to Spain, he engaged some pirates on the way, took command of the India fleet, and, running across, returned with a valuable fleet long before he could have been expected. He next swept away the piratical vessels hovering on the coast of Spain; then with only four vessels he carried to the Low Countries money and reën-

forcements that enabled Philip to win the battle of St. Quentin. He was constantly employed during the war, and toward the close he crossed France in disguise, to fit out a fleet to convey Philip back to Spain. He landed the king and court with his usual celerity. He was next made general of the India fleet, and did not return to Spain till July, 1560. In 1565 he was appointed adelantado of Florida, with orders to plant a colony. While preparations were on foot, tidings came that French Huguenots, under the auspices of Coligny, had settled in Florida. The desire of breaking up this colony led to increasing the force of Menendez. His fleet of 34 vessels carried 2,646 persons, including cultivators, mechanics, priests, and soldiers. He sailed from Cadiz June 29, 1565, and vessels for his colony sailed about the same time from other ports of Spain. On reaching Porto Rico in August, with a small part of his force, Menendez heard that Ribault had reinforced the French, and that a Spanish vessel had been captured. He ran into the St. John's river, and announced to the French his name and his purpose of exterminating them. He then returned to St. Augustine, which he discovered and named. Ribault followed and attempted to invest him; but he was driven off by a storm, and Menendez resolved to proceed overland and surprise the French fort, and carried out his plans amid great difficulties. Fort Caroline was captured, and nearly all the colonists of both sexes were put to the sword; some escaped with Laudonniere to the French ships, and about 70 were spared. Menendez garrisoned the fort, called it San Mateo, and returned to St. Augustine. Meanwhile Ribault had been wrecked on the coast, and after much suffering from hunger he and his followers surrendered on promise of mercy from Menendez. With atrocious perfidy and cruelty they were nearly all put to death. (See **RI-BAULT**.) Menendez then pushed on his works at St. Augustine, and established Fort Santa Lucia at Cape Carnaveral, and Santa Elena at Port Royal harbor, S. C. The next year Sancho de Arciniega brought out 1,500 more settlers with supplies. Menendez sent up to explore the coast as far as St. Mary's, now Chesapeake bay. He then returned to Spain to report what he had effected. During his absence Dominique de Gourgues, a French adventurer, captured San Mateo and avenged the massacre of the French. (See **GOURGUES**.) In 1570 Menendez sent a vessel with a colony of Jesuits to begin a mission on the Rappahannock. An Indian chief, who had been in Mexico and Spain and become a Christian, was their guide, but he turned traitor, and the whole party were massacred. Menendez on his return from Spain in 1572, hearing of the destruction of the colony, at once sailed up the Potomac and avenged the massacre. He then explored the whole coast, and was devoting himself to the increase of his colony when

the king appointed him to command a fleet destined against the Low Countries. While pushing forward the preparations he died.

MENES. See *Egypt*, vol. vi., p. 459.

MENGES, Anton Rafael, a German painter, born at Aussig, Bohemia, March 12, 1728, died in Rome, June 29, 1779. His father, a miniature painter, took him when a child to Dresden, and compelled him to pursue his art studies without relaxation. Young Menges throve so well under this severe treatment, that in his eighth year he designed a subject from the *Æneid*, and at 14 was a skilful painter. In 1741 his father took him to Rome, and compelled him to devote nearly his whole time to the study of the works of Raphael and the old masters in the Vatican, of which he made several copies in miniature for Augustus III. of Poland and Saxony. Returning to Dresden at the end of three years, he was appointed court painter, with permission to return to Rome, where he established his reputation by a holy family, the figure of the Virgin in which was painted from a beautiful peasant girl, whom he subsequently married. In 1749 he was again in Dresden, but in 1751 obtained the permission of the elector to return to Rome. Here he undertook the direction of the new academy of art. Among the works which he executed in the next few years were a copy of Raphael's "School of Athens" for Lord Percy, afterward duke of Northumberland, the frescoes in the church of San Eusebio (1757), and those of "Apollo and the Muses on Parnassus" in the villa Albani, which were engraved by Raphael Morghen. The king of Naples, on succeeding to the throne of Spain as Charles III., invited him in 1761 to Madrid, where he executed a number of works in the royal palace, including his "Aurora." In 1770 he again went to Italy, where he executed a great allegorical screen painting. After three years he returned to Madrid, and produced several works, including his masterpiece, the "Apotheosis of Trajan." On a visit to Monaco he painted his picture of the "Nativity." In 1776 he returned to Rome for the last time. His merits have been much exaggerated by his friends, and quite as much underrated by others. As a theorist and writer on art he is still a standard authority, and his remarks on the antique and criticisms of the works of the old masters were highly esteemed by the artists of his own age as well as by Winckelmann, Lanzi, and other eminent critics and historians of art. His writings were published under the title *Opere di Antonio Raffaele Menges* (Parma, 1780), and have been translated into Spanish, German, English, and French.

MENIFEE, an E. county of Kentucky, bounded N. E. by Licking river and S. by Red river, a tributary of the Kentucky; area, about 450 sq. m.; pop. in 1870, 1,986, of whom 16 were colored. The surface is hilly and broken; the soil is generally productive. The chief pro-

ductions in 1870 were 1,760 bushels of wheat, 73,725 of Indian corn, 10,662 of oats, and 4,111 of potatoes. There were 384 horses, 467 milch cows, 667 other cattle, 2,116 sheep, and 2,130 swine. Capital, Frenchburg.

MENINGITIS. See *BRAIN, DISEASES OF THE*, vol. iii., p. 200.

MENIPPUS, a cynic philosopher, originally a slave, a native of Gadara in Syria, lived toward the close of the 4th, or, according to others, about the middle of the 1st century B. C. He amassed great wealth by usury, but was cheated out of it, and committed suicide in despair. He was the author of 13 treatises, all of which are lost. His works contained nothing serious, but abounded in jests and sarcasms. Lucian, in his "Dialogues of the Dead," makes Diogenes describe him as an old bald-headed man in a tattered cloak, incessantly ridiculing the pedantry of his brother philosophers.

MENHADEN, a North American fish of the herring family, and genus *alosa* (Cuv.), which differs from the herrings (*clupea*) in having a deep notch in the centre of the upper jaw. This fish (*A. menhaden*, Storer), called also



Menhaden (*Alosa menhaden*).

hardhead and mossbunker by fishermen, varies in length from 8 to 14 in.; the color above is greenish brown, darkest on the top of the head and at the snout; upper part of sides roseate with indistinct bluish mottlings, disappearing after death; abdomen silvery, gill covers cupreous, a black spot upon the shoulders, and the whole surface iridescent. The body is elongated and compressed, the gill covers very large, eyes moderate, gape large, and lower jaw the shorter. This species comes into Massachusetts bay in May, and departs in November; great quantities are taken in nets around the outer islands of Boston harbor during the night; sometimes 100 barrels are taken at one haul, and such as are not ground up for bait are sold for food at about half a cent each; being rather oily, they are not very palatable, but make excellent manure. A single menhaden of common size is considered equal in richness to a shovelful of barnyard manure; in some parts of Cape Cod they are sold at \$1 a thousand, and 2,500 are considered sufficient for an acre of land; the odor arising from their decomposing bodies is almost unendurable. They are found from the British provinces to the coast of New Jersey, swimming in countless numbers near the surface, and attended by sharks, blufish, gulls, and other predaceous species. They are never

found in fresh water.—Menhaden oil is of value, being used principally in leather dressing, but also to some extent in rope making and for painting. The scrap or refuse, after extracting the oil from the boiled fish, is used in the manufacture of fertilizers. The business of catching menhaden for oil and guano has within 15 years assumed extensive proportions. It is carried on from Maine to New Jersey, and is especially prominent in the E. portion of Long Island. They are caught chiefly in purse nets as far out as 30 m. from land, but also in shore seines and other nets. Those taken on the Maine coast yield more oil than those caught further south. In 1873 there were 62 factories in operation on the coast of New York and New England, employing 383 sailing vessels and 20 steamers, with 2,306 men on shore and at sea; capital invested, \$2,388,000; total catch, 1,193,100 barrels (250 fish to a barrel), yielding 2,214,800 gallons of oil and 36,299 tons of guano; value of products, about \$1,600,000.

MENNONITES, a denomination of Protestants who reject infant baptism and baptize adult persons only on a profession of faith, and practise non-resistance and abstinence from oaths. They thus combine some of the leading principles of the Baptists with some of the distinctive views of the Friends, though historically they preceded both. Originally they were called by their opponents Anabaptists, while they called themselves in Switzerland and south Germany *Täufer*, i. e., baptizers; in the Netherlands *Doopsgezinde*, i. e., persons holding special views as to baptism. They were called Mennonites because they were reorganized and more fully indoctrinated by Menno Symons. The chief points in their history are the following. In January, 1525, at Zürich, two young scholars, Conrad Grebel and Felix Manz, and a former monk, George Blaurock, organized the first church which professed all the leading principles of the body. They rapidly spread in Switzerland, being most numerous at St. Gall. Persecution soon drove many of them to southern Germany, where Augsburg and Strasburg became their strongholds. Here also persecution broke out, and more than 3,000 of them suffered martyrdom in Swabia, Bavaria, Austria, and Tyrol. They found refuge in Moravia, where they greatly increased, until the thirty years' war drove them away. About 1545 a confession of faith was published by them in Moravia (republished, Berlin, 1869), which distinctly enjoins pouring as the mode of baptism. When in 1527 and 1528 various leaders of the Anabaptists had perished at the stake, enthusiasts rose in their places. The chief among these was Melchior Hoffmann, a Swabian, through whom the principles of the Anabaptists, mixed with his chiliastic views, were first disseminated in the Netherlands. His fanatical follower, John Matthias of Haarlem, in 1533 inaugurated the atrocities of Münster in Westphalia, which, though committed

by men who had deviated from the original principles of the sect, were charged to the whole body. The history of the Dutch Mennonites, as after the accession of Menno Symons the Anabaptists were called, is written in blood. About 6,000 of them suffered martyrdom under the rule of Philip II. of Spain. When the Netherlands rose for their independence, William of Orange favored them, but other leaders of the reformed party opposed them, and it was not till 1651 that toleration was secured to them by a general law. Besides oppression, internal dissensions greatly checked their growth. In 1557 they were divided into two parties, the more rigid being called the Frisians, the more moderate the Flemings, to which a third party, the Waterlanders, was soon added. The points of difference between these parties related only to church order and discipline. About the middle of the 17th century doctrinal dissensions brought about new divisions. All Mennonites agreed in doctrine with the Remonstrants or Arminians of Holland; but when some of them, with a large part of the Remonstrants, adopted Socinian views, the other Mennonite churches opposed them. It was not till 1801 that all Dutch Mennonites were reunited in one body and founded a theological seminary at Amsterdam. At present they enjoy full religious liberty, and are highly respected; many of them are among the richest men in the country; but their number has decreased from 160,000 in 1700 to fewer than 20,000 in 1873.—In Switzerland the Mennonites, up to the middle of the present century, were oppressed in many ways, one of which was, that their infants were forcibly taken from them to be christened. In consequence of this, large numbers emigrated to Alsace and the Palatinate. At present they number in Switzerland and southern Germany about 8,000 communicants, and in East Friesland, the province of West Prussia, and other parts of northern Germany, about the same number. They are more numerous in southern Russia, whither they began to emigrate from West Prussia in 1783, settling first on the banks of the Dnieper, and later near the sea of Azov. Here they acquired considerable wealth, and in 1870 formed a population of about 40,000. By special decrees of the emperors they were exempted from military duty. In 1871, however, this privilege was abolished, and no alternative was left them except conscription or emigration, the privilege of emigration being confined to the period from 1871 to 1880. This measure caused thousands to emigrate to the United States. The first colonies, arriving in 1873, settled in Minnesota and Kansas. The emperor subsequently modified the decree relative to conscription with a view of arresting the movement.—The emigration of Mennonites to the United States began with the settlement of New York, some of them having been among the first Dutch settlers. The first church was organized in 1683 at Germantown near Phila-

delphia, and consisted mainly of Hollanders; the first meeting house, built in 1708, still stands. In 1709 began a much larger emigration from Switzerland and the Palatinate. These settled in Lancaster co., Pa. As their religious views then were but little known, they republished the confession of faith adopted at Dort in 1627, which is still adhered to by all Mennonites in America. In the beginning of the 19th century they began to spread from Pennsylvania and Maryland to the western states and Upper Canada. As few of them keep lists of membership or minutes of their annual conferences, it is impossible to ascertain their exact number. According to the most recent estimates, the number of their communicants in America is about 60,000, with 500 meeting houses, those in Canada constituting one eighth of the whole. They are most numerous in Pennsylvania, Ohio, Indiana, and Canada. Their principal divisions are: 1. The Old Mennonites, by far the largest body, having a publishing office at Elkhart, Ind. 2. The Reformed Mennonites (in German *Herrn-Leute*), founded in 1811 by John Herr, who returned to the rigor of the ancient Frisian Mennonites, prohibiting all religious intercourse with other Christians, even at funerals and family prayers. They are very strict in the reception of members and in the separation from the excommunicated. 3. The New Mennonites, organized in 1847 by J. H. Oberholtzer, have introduced various reforms, and founded a theological seminary at Wadsworth, Ohio. Their publishing office is at Milford Square, Pa. 4. The Evangelical Mennonites separated from the preceding party in 1856, because they held it to be a duty of all Christians to hold stated meetings for prayer. 5. The Amish Mennonites, usually called Omish, next to the Old Mennonites, are the most numerous body in America. They first rose in 1693 in Alsace. Their founder, Jacob Amman, after whom they were named, enjoined on his adherents strict separation from the excommunicated, feet washing, and greater plainness in dress. They discarded the use of buttons on their clothing, and hence were called *Häftler* or Hooker Mennonites, while the others were known as *Knöpfler* or Buttonites.—In their general doctrines the Mennonites agree with the great body of evangelical Christians. In church government they are in Europe Independents, while in America they somewhat resemble Presbyterians, inasmuch as the resolutions of their annual conferences are binding on the churches. They have bishops, preachers, and deacons; but the only difference between the bishop and the preacher is that the former is ordained, the latter only licensed to preach. Baptism is administered to almost all children of Mennonites when they arrive at a certain age, in Germany in their 14th year, in Holland and America about their 18th. The mode, except among the Evangelical and some of the New Mennonites,

is always pouring. The Lord's supper is celebrated twice a year, preceded in America in a large majority of churches by feet washing. All Mennonites consider honesty, industry, and plainness of dress and manners to be prominent Christian duties. They do not assume public offices, which would make it necessary for them to take an oath or to inflict punishments. They never go to law. On this continent, as in most parts of Europe, they are nearly all farmers.—Almost the entire Mennonite literature is in Dutch and German. The principal works are: T. J. van Braght, *Het bloedige tooneel der Doopsgezinden en weereelse Christenen* (Dort, 1660; Amsterdam, 1685); Hermann Schyn, *Historia Christianorum, qui in Belgio Fœderato Mennonitæ appellantur* (Amsterdam, 1725 and 1729); Blaupot ten Cate, *Geschiedenis der Doopsgezinden in Friesland, Holland, Zeeland, &c.* (Amsterdam, 1837-'50); J. A. Starck, *Geschichte der Taufe und der Taufgesinnten* (Leipsic, 1789); Hunzinger, *Das religiöse Kirchen- und Schulwesen der Mennoniten* (Spire, 1831); and Cornelius, *Geschichte des Münsterischen Aufbruchs* (Leipsic, 1855).

MENNO SYMONS (commonly written MENNO SIMONS, and defined as "Menno, son of Simon;" but Symons was his surname), a religious reformer, born at Witmarsum in West Friesland about 1496, died at Wustenfelde, Holstein, Jan. 13, 1561. In 1524 he became a vicar at Pingjum, where he studied the Bible and preached repentance. In 1531, in the neighboring city of Leeuwarden, Sicke Snyder, an Anabaptist, was beheaded. This led Menno to examine the question of infant baptism, which he thereafter considered unscriptural. Yet he accepted a call as curate of Witmarsum, and while he resided there a band of Anabaptists seized and fortified a cloister in the vicinity, but were captured and put to death (February, 1535). Menno's brother was among the slain, and he reproached himself for not having joined these brethren, in order to teach them better. Renouncing the Roman Catholic church and the priesthood, and accepting a call to be the pastor of a few Anabaptists who never had been connected with the fanatical party, Menno began the life of an itinerant preacher, and with others organized numerous churches, principally in West Friesland. In 1543 persecution became so severe that he had to leave his native province. He first went to Cologne, where a flourishing church was gathered. Driven from there in 1546, he travelled in Holstein, Mecklenburg, and Livonia, preaching and organizing churches. The last years of his life were embittered by dissensions among his adherents on the nature of ecclesiastical excommunication. The stricter party, led by Bouwens, insisted on total separation from an excommunicated person, even on the part of the wife. The milder party objected to this. Menno, to avoid excommunication, sided with the stricter party, a step which he afterward

regretted. At Wüstenfelde, where he died, he had liberty to print his books. His principal work is the "Fundamental Book on the saving Doctrine of Christ" (1539). His writings, all in Dutch, were first collected in 1600, then in 1646; the last and most complete edition was printed at Amsterdam in 1681. While he agreed with the Swiss Anabaptists on non-resistance and the unlawfulness of oaths, he held Luther's views on justification. From both he differed in believing that Christ did not take his flesh from Mary, but that a heavenly human nature passed through her as a channel. Feet washing as an ordinance was never taught by Menno. The mode of baptism is mentioned in his writings only once, and in such a way that it appears that he practised pouring. The best biography of Menno is *Het leven en de verrichtingen van Menno Symons*, by A. M. Cramer (Amsterdam, 1837). (See ANABAPTISTS, and MENNONITES.)

MENOBRANCHUS, *Proteus* of the Lakes, or **Fish Lizard**, a batrachian of the order *amphipneusta*, and of the division of perennibranchiate amphibia, so called because the gills are persistent and external; the order includes also the *proteus* of Europe, the axolotl, *amphiuma* or Congo snake, *menopoma* or hellbender, and *siren* or mud eel of the United States. In the genus *menobranchnus* (Harlan) or *necturus* (Raf.), the head and mouth are large; the upper jaw with a series of small sharp-pointed teeth, the palate also similarly armed; neck contracted, with three branchial tufts on each side; tail compressed laterally and fringed with a delicate membrane; limbs four, each four-toed; eyes small and without lids; the lips thick and fleshy; the tongue large, entire in front, and movable only at the tip and anterior edges; nostrils small and near the margin of the upper lip; the body elongated and sub-cylindrical, covered with a smooth skin; toes without nails. The best known species is the spotted menobranchnus (*M. maculatus*, Barnes), about 12 in. long, of a cinereous dusky gray, with sub-circular darker spots, and a brown stripe extending from the snout over the eyes; it is



Menobranchnus lateralis.

found in the great lakes of North America and in Lake Champlain, and in the streams opening into them. In *M. lateralis* (Say) the color is dusky brown above, with a dark band from the nostrils through the eye and along the sides to the tail, and dirty flesh-colored

below; the form is more slender than in the other species; it is found only in the western waters running into the Mississippi, especially if not entirely on its eastern side, from Pennsylvania to Tennessee; it is often called mud puppy. In many specimens kept alive by the writer, some of them for three or four years, obtained from Portage lake, the gills, three on each side, were provided with an immense number of very delicate fringes, deep red when the animal was actively breathing, which were kept waving to and fro in a most graceful manner during respiration; the four limbs, about an inch long, were set almost at a right angle, and the gait was consequently very awkward; the movements executed by the tail are rapid and graceful; the vent is longitudinal; the general aspect of the head is snaky and forbidding, and the Indians erroneously consider them venomous. The specimens above mentioned were very tenacious of life, having been imprisoned under ice half an inch thick every night for three months without apparent injury, and ate nothing for six months except what they obtained from the water. They often came to the surface to swallow air, which is emitted at the gill opening in bubbles accompanied by a faint squeak. Generally sluggish in their motions, and avoiding the sunlight, they seize living worms eagerly, sucking them down if small at a single gulp, or, if large, by repeated efforts; the sight is not very good, and they rarely snap at their prey unless it touches their mouth. They are sometimes taken on hooks by persons angling for mud fish; they are most active at night, moving rapidly at this time, and often throwing themselves nearly out of water; they feed on insects, worms, small crustaceans, and other living prey. The gills when inactive shrink, and become of a slaty gray color; they are cleansed from impurities by means of the fore feet. When the branchial fringes are lost by accident, the animals do not appear to suffer. They have rudimentary lungs or pulmonary sacs, which assist in respiration by means of the swallowed air; but these are not sufficient of themselves to support life, as the animals die out of water in about four hours; with the cutaneous respiration, active in all amphibians, the air sacs are able to purify the blood. These animals, having both lungs and gills, though the former are insufficient to prolong life except for an hour or two, probably come as near as any to the fabulous amphibians able to live in water or air. There is no evidence that this animal, like the axolotl, is developed into any terrestrial salamander. (See AXOLOTL.)

MENOMINEE, a S. W. county of the upper peninsula of Michigan, bordering on Green bay, separated from Wisconsin by the Menominee river, and watered by several streams; area, about 1,300 sq. m.; pop. in 1870, 1,791. The surface is broken and hilly, and the soil moderately fertile. There are extensive forests. It is traversed by the Peninsular divi-

sion of the Chicago and Northwestern railroad. There were 4 saw mills in operation in 1870, producing lumber to the value of \$599,000. Capital, Menominee.

MENOMONEES, or **Menominees**, a tribe of American Indians, belonging to the Algonquin family, and from their first discovery to the present century residing on the Menominee river, which empties into Green bay, Wis. Their traditions point to an emigration from the east, but as early as 1640 they were known to the French as residing near Green bay, their name being that of the wild rice on which they in great part subsisted. Missions were established among them as early as 1670 by the Jesuits Allouez and André. They were lighter in complexion than the neighboring tribes, and remarkably well formed. They continued friendly to the French till the troubles caused by La Salle's monopoly, when they are said to have instigated the murder of some men employed at the Jesuit mission; but they made reparation, and when the Foxes made war on the French, the Menomonees marched to the relief of Detroit in 1712, and subsequently drove the Foxes from the bay. In the operations against the English they were frequently in the field from 1712 to 1763, some of their braves figuring in Braddock's defeat and the battles of Fort William Henry and the Plains of Abraham. When the American revolution began, they, under their chief Chakauchokama, or Old King, adhered to the English side, and a part of the warriors went to Montreal; but Clarke's success in Illinois checked all operations on their part in the west till 1780, when they served in the expedition against the Spaniards at St. Louis. After the close of the war they remained friendly till the second war with Great Britain, when they were again won over by English officers, and under Thomas Carron helped to capture Mackinaw in July, 1812, fought under their chief Souigny with Tecumseh at Fort Meigs in 1813, and under Carron and Grisly Bear were repulsed by Croghan at Sandusky. They were also at the battle of Mackinaw in 1814, and probably in the capture of Prairie du Chien. On March 30, 1817, Towaapee and other chiefs made a treaty with Clarke, Edwards, and Chouteau, ratifying land grants of the French, English, and Spanish governments, and giving up prisoners. The treaty of 1825 recognized their territory as bounded N. by the Chippewa country, E. by Green bay and Lake Michigan, south by the Milwaukee river, and W. by the Black. The treaty of 1827 settled the line between them and the Chippewas. That of Feb. 5, 1831, began the cession of their lands and the payment of money. That of Sept. 3, 1836, ceded a large tract for \$620,110. In the mean time they served the United States in the Sac and Fox war. In 1862 and 1868 the official reports give half or two thirds of the tribe as Catholic, the rest being pagan. Schools have been maintained with great regularity, but inconsiderable effect on

the tribe, very few acquiring English. After the cession of their lands their reservation was between the Wisconsin, Wolf, and Fox, and the Chippewa country. By a treaty in 1848 they were to remove west of the Mississippi; but the nation repudiated the treaty. In November, 1852, they were placed on the Upper Wolf and Oconto rivers, Wisconsin, 50 m. from Green Bay, and the reservation was secured to them by treaty in 1854. It consists of 230,400 acres of very poor land. Oshkosh, grandson of Old King, was at this time the head chief, and remained so till his death in 1858. They refused to join the Sioux in their outbreak in 1861, and several of the warriors served as volunteers in the United States army during the civil war. They have declined rapidly in numbers. In 1822 they were estimated at 3,900, and in 1872 were reported at 1,480. Disease, and especially intoxication, which seems ineradicable, are steadily destroying the tribe. Their language is a very peculiar Algonquin dialect, with strange guttural sounds and accents, and differs from the other dialects in the inflection of the verbs and other parts of speech.

MENOPOMA, a North American tailed batrachian reptile, one of the series of animals which seem to connect the perennibranchiate amphibians with the salamanders. The genus *menopoma* was established by Harlan in 1825, though Leuckhardt had formed the genus *cryptobranchus* in 1821. The generic characters are: large and flat head; upper jaw with two concentric series of minute teeth, the inner the less extensive, lower jaw with a single series; a single branchial orifice on each side; branchiæ rudimentary and evanescent; extremities four, the anterior with four fingers, the posterior with five, short and palmated; skin loose and folded on the sides of the body. The common *menopoma* (*M. Alleghaniense*, Harlan) attains a length of about 15 in., of



Menopoma Alleghaniense.—1. Head. 2. Mouth.

which the head is $1\frac{1}{2}$ and the body 9; the large mouth is provided with thick lips, and the snout is full and rounded; the nostrils anterior and very small, the eyes minute and black; no cutaneous fold at the throat; body stout and thick, the vent a circular fringed

orifice; tail large, much compressed laterally, with a rayless cutaneous fin along the upper border. The color is said by De Kay to be pale slate, mottled with dusky. It lives in fresh water, and is carnivorous and voracious, feeding on fish, worms, and mollusks; it is found in the Alleghany river and its tributaries, and many of the branches of the Ohio and Mississippi; its most common name is "hellbender." Dr. Holbrook describes another species (*M. fuscum*), from western South Carolina, brownish above and yellowish white below; both species have the limbs fringed posteriorly.—Van der Hoeven places the gigantic salamander of Japan in the genus *cryptobranchus*, under the name of *C. Japonicus*. This animal, the largest of the known naked amphibia, growing to a length of more than 3 ft. and to a weight of nearly 20 lbs., was discovered by Siebold, who had several specimens alive, and kept one for many years in Europe. The form is robust; the tail occupies about one third of the length, and constitutes the principal organ of locomotion, assisted by a loose fold of skin extending from the head along the sides to the origin of the tail; the lips are not very distinct, and the tongue is small; the occiput is separated from the neck by two wide protuberances formed by the muscles of the jaws; the skin above is covered with numerous rough prominences, which give it a very forbidding appearance; the color is dark brown, with wide blackish spots. Van der Hoeven maintains that this is not distinguished from *menopoma* by any generic character; it resembles the latter in form, habits, bones of the skull, number of vertebrae (20 in the trunk and 24 in the tail), sternum, pelvis, ribs, and extremities; the bones present cavities opening externally; there is no gill aperture, and the branchiae disappear early. It is slow in its movements, remaining quiet at the bottom of the water, rising to the surface every five or ten minutes to breathe air both by the nostrils and the mouth, but able to remain half an hour under water without renewing the contents of the lungs; generally inoffensive, it will bite severely when irritated; it is voracious, feeding upon fish, frogs, insects, and even its own species, which it seizes with a sudden movement of the head; after eating, it generally fasts a week or two, and it is less voracious in winter than in summer; it is able to endure extremes of heat and cold, and has a remarkable power of reproducing lost parts; on land its motions are very awkward and slow. This species is confined to the lakes and streams of the high mountains of Nippon, between lat. 34° and 36° N., and to some other parts of Japan and parts of China; it is employed by the native physicians, in the form of food, as a preservative against contagious diseases and as a remedy in pulmonary complaints. There has been for some years a living specimen in the zoological gardens in London. The

remains of the gigantic salamander found in the tertiary fresh-water formations of Oeningen, formerly regarded as fossil human bones, the *homo diluvii testis* of Scheuchzer, are referred to this genus by Van der Hoeven, under the name of *C. primigenius*; in size, form, and structure it comes near to the Japanese species, and is one of the most interesting of the antediluvian animals which inhabited the fresh waters of Europe. The famous footprints of Hildburghausen, Germany, on which was established the *cheirotherium* of Dr. Kaup, have also been referred to a similar salamandroid batrachian. (See LABYRINTHODON.)

MENSES. See CATAMENIA.

MENSHIKOFF. I. Alexander Danilovitch, prince, a Russian statesman, born in Moscow about 1672, died in Berezov, Siberia, Nov. 2, 1729. The son of poor parents, he was brought up without education, and apprenticed to a baker; but having entered the service of Peter the Great, he commended himself to his patron's favor by discovering a conspiracy among his guards. He served in the campaign of Azov, accompanied the czar to Holland and England, and on the death of Lefort became his principal adviser, being equally active in preparing or executing the great schemes of national reform, and in the warlike and diplomatic operations against Charles XII. He distinguished himself at the siege of Schlüsselburg in 1702, and was made major general and governor of Ingria in 1704. During the campaign of 1706 he gained the decisive battle of Kalisz over the Swedes. He was made a prince both of the German empire in 1706, and of Russia in 1707. In 1709 he greatly contributed to the victory of Poltava, and was made a field marshal; in 1710 he commanded the Russian forces in the north, and took Riga; in 1711 he occupied Courland, and was made governor of St. Petersburg; in 1712 he occupied Pomerania, and in 1713 took Stettin. His cupidity led him to commit numerous arbitrary acts, for which he was finally court-martialled and sentenced to death, but escaped with a heavy fine. He regained his influence under Catharine I. (1725-'7), of whose accession to the throne he was the principal instrument, and till her death exercised full sway over Russia. He was still more powerful at the beginning of the reign of the young Peter II., whose father-in-law he was about to become when he was suddenly arrested through the influence of Dolgoruki (September, 1727), and banished with his family to Siberia. He at first bore his misfortunes with great firmness, but the loss of his wife and eldest daughter broke his spirit and hastened his death. The remaining members of the family were recalled in 1730 by the empress Anna. **II. Alexander Sergeyevitch**, prince, a Russian soldier, great-grandson of the preceding, born in 1789, died May 3, 1869. He entered the imperial service in 1805, was for some time attached to the embassy at Vienna, accompanied Alexander I. as aide-de-camp du-

ring the campaigns of 1812-'14, and was promoted to the rank of general, but resigned in 1823, when the czar abandoned the cause of the Greeks. Under Nicholas he served as ambassador in Persia, as well as in the war with that country which broke out on his return, and soon after in the Turkish war of 1828-'9. He took Anapa, was seriously wounded before Varna, and subsequently devoted himself to the restoration and development of the Russian navy, being appointed governor general of Finland in 1831, admiral in 1834, and minister of marine in 1836. In 1853 he was sent to Constantinople, to urge the claims of Nicholas in the affairs of Turkey. His extravagant behavior promoted a speedy rupture; he returned to Russia, and war was declared. The first victory of the Russians over the Turkish fleet at Sinope is attributed in part to Menshikoff's previous reconnoitings in Turkey. Commanding both the land and naval forces in the Crimea, he lost the battle of the Alma, but strengthened the fortifications of Sebastopol, sacrificed a part of the fleet to bar the entrance of the harbor, and, though he lost another battle at Inkerman, distinguished himself by the utmost energy in defence of the fortress. He fell ill and was superseded by Gortchakoff in March, 1855, and was appointed by Alexander II. commander of Cronstadt, whence he was recalled to St. Petersburg in April, 1856. He was among the staunchest members of the national or old Russian party, and was opposed to all reforms.

MENSURATION, the art of measuring things which occupy space. This is the art which led to the formation of the science of geometry; and some schools of philosophy at the present day are inclined to limit the whole domain of mathematics to the field of mensuration, while extending this field so as to include time as well as space. The art is partly mechanical as well as mathematical, and even in its mathematical part is but the application or illustration of sciences that in their purity have no connection with material things.—There are three kinds of quantity in space, viz., length, surface, and solidity; and there are three distinct modes of measurement, viz., mechanical measurement, geometrical construction, and algebraical calculation. For the last two modes arithmetical computation is a necessary adjunct; for the ratio to a unit quantity can be definitely stated in particular cases only as a numerical ratio. Lengths are measured on lines, and the measure of the length of a line is the numerical ratio which the line bears to a recognized unit of length, the inch, foot, or mile, determined in England and in this country by reference to metallic rods three feet long, kept by the governments as standards. The mechanical mode of determining lengths is called direct measurement. Rods are directly compared with the standard, and accurately made of the same length, and these rods, "rules," or yard sticks, or else tapes and chains

accurately graduated by direct comparison with such rules, are stretched side by side with the line to be measured, and the ratio observed. When the line is long and the rule is applied many times consecutively, the slight errors arising at the joining of the successive positions of the rod, being multiplied, become of serious practical importance. In geodesy, therefore, when base lines several miles long are to be accurately determined by direct measurement, an apparatus is used in which bars of different metals counteract each other's expansion and contraction. When the line is long, or when it is inaccessible, the length is usually measured by the second or third mode.—The measurement of a line by geometrical construction is effected by the direct measurement of accessible lines and angles in a figure of which the line to be measured forms a component part, and then drawing this figure upon paper, on a definite scale of a certain number of feet to the inch. The direct measurement of the unknown side upon the paper will evidently give the length of the line represented by it. Thus, if one ship has sailed 50 miles E., and another from the same port 100 miles 30° E. of S., and we wish to know their distance apart, we may draw a line one inch long and a line half an inch long, making an angle of 60° with each other, and we shall find their extremities separated by $\cdot 866$ of an inch, showing the ships to be 86.6 miles asunder. We do not include angles among quantities in space. Strictly an angle is a quantity, since it can be measured, and its measurement is necessary at times for the measurement of other quantities. But the measurement of angles is not, in the general use of language, included among the direct objects of mensuration. The measurement of a line by algebraic computation is effected as in geometrical construction, except that instead of drawing the figure we calculate the length of the unknown side from the known relations of the sides and angles of figures, and from tables giving numerical values for those relations in right triangles, into which all plane figures can be divided at pleasure. In practice, it is easier to measure angles with great accuracy than long lines, and hence in geodesy only one base line is actually measured, while all the other distances of the survey are computed from the measurement of the angles in a network of triangles.—The second kind of quantity to be measured is surface. The area of a surface is its numerical ratio to a square surface whose side is a linear unit, that is, to a square foot, square inch, &c. This sort of measurement is never done directly or mechanically, but always by the measurement of lines, and generally by the use of the geometrical propositions, that all surfaces may be resolved into triangles; that all triangles are equivalent to the halves of rectangles having the same base and altitude; and that the area of a rectangle may be found by multiplying the number of units in its length by that

in its breadth. The reduction of all surfaces to subjection to these propositions requires sometimes so much labor, that in surfaces of a more intricate form use is made of algebraical laws and of the differential calculus, according to the fundamental idea of fluxions, that a surface is generated by a moving line which constitutes, in two positions, two of the boundaries of the surface. Thus a circle may geometrically be considered as composed of an unlimited number of triangles with their bases on the circumference and their vertices in the centre; or it may be considered algebraically as generated by a chord sweeping across it, beginning of no length, swelling to a diameter through the centre, and contracting again to zero. Either of these modes of viewing it leads to the same area of the circle, viz., the product of its circumference by half its radius, or, what is the same thing, $\frac{1}{2} \pi r^2$ of the square enclosing it.—The third species of quantity is solidity. The unit of measurement is here either a cube whose edge is a linear unit, or else it is an arbitrary number of cubic inches selected as a unit, such as the bushel of 2,150 inches, or the gallon of 231 inches. The direct or mechanical measurement of solidity is applied to liquids, or to solids separated into parts so small as to be handled somewhat in the manner of a liquid, as corn, for example, is poured from a basket. This direct measurement consists then in filling a vessel of known capacity with the article to be measured, repeatedly, until all is measured. The geometrical and algebraical modes of measuring solidity will be understood from the analogous modes of measuring lines and areas. They are principally based on the doctrines, that the solidity of a right parallelepiped is found by multiplying the area of its base by its altitude; that a pyramid has one third the solidity of a parallelepiped of the same base and altitude; and that every solidity can be divided into pyramids and parallelepipeds. But in intricate cases it is easier to use fluxions, and consider the solid generated by the motion of a surface through it; a hemisphere, for example, might be considered as an unlimited number of pyramids with their apices at the centre, or as generated by the circular plane of its base, diminishing as it rose to the summit of the hemisphere, and there becoming a point. Mechanics use arithmetical rules or formulas derived from considerations such as we have here presented. The cask or barrel, for example, is treated as though one of several varieties of geometrical solids, and rules are given for discovering its solidity on those suppositions. The gauge rod is marked with the number of gallons which a cask of certain form would have if its diagonal distance from the centre of the bung to the inner end of the staves were the same as from the end of the rod to the spot where that number is engraved; and thus by thrusting the rod diagonally into the bung hole of an ordinary cask, the number of gal-

lons it contains is readily determined. The tonnage of ships is computed in the same way by assuming the figure of the ship to be of a certain model, and the tonnage is under- or over-estimated according to its departure from this average form. Many works have been published containing only practical rules without explanation, all essentially alike. In particular cases, ingenuity may devise particular modes for measuring the solidity or the area of very complicated figures; the earliest example is that of Archimedes determining the solidity of Hiero's crown by plunging it into water to discover how much of the fluid it displaced. Another example is Galileo's determination of the area included between a cycloid and its base by describing the cycloid upon a plate of metal, cutting it out, and comparing its weight with that of the generating circle cut out of a similar plate.

MENTCHIKOFF. See **MENSHIKOFF.**

MENTONE (Fr. *Menton*), a town of France, in the department of Alpes-Maritimes, on the gulf of Genoa, 12 m. N. E. of Nice; pop. about 10,000. It is on two small bays, called respectively the East and the West bay, which are separated by a point of land, and is shut in on the land side by a semicircular range of mountains from 3,000 to 4,000 ft. high. Mentone has one of the mildest climates on the Ligurian seaboard, and is a place of much resort in winter, especially by consumptives. Ample provision is made for the accommodation of visitors. The old town, situated chiefly on the point dividing the bays, is well built and clean; it contains a castle and a communal college. In the suburbs are elegant villas, and the lower hills in the background are covered with olive groves and plantations of oranges and lemons. In the middle ages Mentone formed a part of the principality of Monaco, whose rulers were feudatories of Piedmont. Though swept away by the French revolution, the princes of Monaco were recognized at the congress of Vienna. In 1848 the inhabitants of Mentone and the neighboring Rocebruna rebelled, and annexed their places to Sardinia. Prince Florestan protested, but after the cession of Nice to France in 1860 renounced his rights for a pecuniary compensation (Feb. 2, 1861).—At the E. extremity of the East bay are the celebrated bone caves of Mentone, which have furnished an abundance of interesting organic and other prehistoric remains. These caves, which are about 88 ft. above the Mediterranean, are natural rifts in the Roches Rouges, the mountain over which the Cornice road passes. On March 26, 1872, a fossil human skeleton was exhumed in one of them, at a depth of $21\frac{1}{2}$ ft. from the surface. It lay on its left side in a natural posture, as if death had overtaken the man during sleep. The skull is ornamented with a number of shells, and with 22 canine teeth of the stag, all of which are perforated and form a kind of network about the head. The skeleton, which is

nearly perfect, and indicates great strength, was placed in the museum of natural history in Paris. It is supposed to belong to the palæolithic age. The cranium is fractured behind

prevailed, and there are several handsome squares. The Gutenberg-Platz contains a monument to Gutenberg, who was born and died in Mentz, with a statue by Thorwaldsen, and



The Bone Caves near Mentone.

and in front, so as to prevent perfect measurement. It is dolichocephalous, arched at the summit, and the sutures are all consolidated. The facial angle is nearly 85° . The height of the man is estimated to have been six feet.

MENTOR, in Homer's *Odyssey*, the son of Alcimus, and friend of Ulysses, who intrusted to him the charge of his house on his departure from Ithaca. To him fell the care of young Telemachus, and Minerva assumed his form in accompanying the latter on the journey in search of his father, acting the part of a wise counsellor. On the return of Ulysses, Mentor assisted him in the contest with the suitors, and brought about a reconciliation between him and his people. The name is applied metaphorically to any sage adviser or monitor.

MENTZ (Ger. *Mainz*; Fr. *Mayence*; anc. *Moguntiacum*), a fortified city of Germany, capital of Rhenish Hesse, on the left bank of the Rhine, nearly opposite its junction with the Main, 20 m. W. S. W. of Frankfort, with which it is connected by railway, and within a few miles of Wiesbaden; pop. in 1871, inclusive of the garrison, 53,918. A bridge of boats 1,700 ft. long connects it with the village of Castel on the opposite bank of the Rhine, and a costly railway bridge, erected in 1862, connects it with the opposite side of the Main. The system of fortification is extensive and elaborate, controlling both sides of the Rhine, and consisting of a double line of wall, with bastions and outworks, and citadel in the centre. The town rises from the river in the form of an amphitheatre. The houses are generally lofty, and many of the streets are narrow and confined. Of late years a better system of building has

prevailed, and there are several handsome squares. The Gutenberg-Platz contains a monument to Gutenberg, who was born and died in Mentz, with a statue by Thorwaldsen, and the Schiller-Platz has a bronze statue of the poet. There are 11 churches, including the church of St. Ignatius, the ceiling of which is adorned with paintings from the life of the saint; and the cathedral, founded in the 10th century and rebuilt in the 14th, of little architectural merit, but having fine painted windows and a beautiful pulpit. It suffered greatly during the siege of 1793, and of its treasures and famous library nothing is left; but it contains the monuments of several of the archbishop-electors of Mentz. The old electoral palace, restored in 1844, contains the town library of 120,-

000 volumes, a picture gallery, and a fine museum of Roman antiquities. There are Roman remains in and near Mentz, which



Cathedral of Mentz.

was a Roman camp under Drusus; among them are the Eichelstein, a great stone on one of the bastions of the citadel, which has been

thought to be a monument of Drusus, and the pillars of an aqueduct and the piers of a bridge supposed to have been built by him. A remarkable fragment of Roman statuary was found here in March, 1874. The site of the house of Gutenberg is occupied by the casino, or reading room, and the rooms of a literary association. The house in which he was born is still standing, and that also which contained his first printing press. The trade up and down the Rhine and the Main, and by the railway, is increasing continually. The manufactures are not very important; they consist mostly of leather, tobacco, soap, pianofortes, hats, glue, and vinegar.—The city was a place of importance under the Romans, and was destroyed by the barbarians in 406. It was rebuilt by the Frankish kings, and enlarged by Charlemagne. Under St. Boniface it became the seat of an archbishop. Under the German empire the archbishop of Mentz ranked first among the three ecclesiastical electors, and held the dignity of arch-chancellor. The electorate, which originally did not embrace the city of Mentz, had extensive possessions on both sides of the Rhine, eventually including Erfurt and Eichfeld. In the 13th century Mentz stood at the head of the league of the Rhenish towns. Through Gutenberg it became the centre of bookmaking. In 1486 it was annexed to the electorate. During the thirty years' war, it was taken by the Swedes in 1631, by the imperialists in 1635, and by the French in 1644. After the peace of Westphalia it was restored to the elector John Philip, who strengthened the fortifications; but it was again taken by the French in 1688, and retaken by the Saxons and Bavarians in 1689. It was betrayed to the French general Custine in 1792, but was reduced by the Prussians under Kalkreuth in 1793. By the peace of Lunéville (1801), which dissolved the electorate (see DALBERG), Mentz was allotted to France, but by the congress of Vienna (1814) to the grand duke of Hesse-Darmstadt, as a fortress of the German confederation, to be garrisoned by a mixed force of Austrians, Prussians, and Hessians, the offices being divided between Austria and Prussia. In the spring of 1848 disturbances among the people led to a riotous and bloody strife, May 21, between the citizens and the Prussian soldiers; but the difficulties were adjusted by a commission from the German national assembly. On Nov. 18, 1857, a military magazine blew up, destroying an entire street, with many lives and much property. On the outbreak of the Austro-Prussian war in 1866, the Austrians and Prussians left the fortress, which was garrisoned by the Hessian troops alone. After the conclusion of peace the Prussians returned, and secured the sole right of garrison. In 1871 it became one of the fortresses of the German empire. It has a garrison of 8,000 men. In February, 1873, it was proposed to remodel the fortifications. Mentz is one of the chief centres of the Catholic societies of

Germany, and in June, 1874, it was made the permanent seat of the Catholic association, whose object is the support of the pope and the bishops against the imperial government.

MENU, or **Manu**. See **BRAHMA**.

MENZEL, Adolf Friedrich Erdmann, a German painter, born in Breslau, Dec. 8, 1815. He assisted his father as a lithographer, illustrated Kugler's popular history of Frederick the Great (1839-'42), and prepared designs for Frederick's writings (1846-'57). In 1850 he exhibited his first oil painting, "Frederick the Great and his Friends." In 1865 he finished his "Coronation of King William I. at Königsberg." Many of his genre pictures appeared in 1870, and also his "Departure of the King for the Seat of War in France."

MENZEL, Karl Adolf, a German historian, born in Grünberg, Silesia, Dec. 7, 1784, died in Breslau, Aug. 19, 1855. He studied at Breslau and Halle, and officiated for many years as professor at Breslau. He wrote *Topographische Chronik von Breslau* (2 vols., Breslau, 1805-'7); *Geschichte Schlesiens* (3 vols., 1807-'10); *Die Geschichte der Deutschen* (8 vols., 1815-'23); *Geschichte unserer Zeit seit dem Tode Friedrichs II.* (2 vols., 1824-'5); *Neuere Geschichte der Deutschen von der Reformation bis zur Bundesacte* (16 vols., 1826-'56); and *Staats- und Religions-Geschichte der Königreiche Israel und Juda* (Breslau, 1853).

MENZEL, Wolfgang, a German author, born at Waldenburg, Silesia, June 21, 1798, died in Stuttgart, April 23, 1873. He began his studies at Breslau, served as a volunteer in the war of 1815, and subsequently studied at Jena and Bonn. In 1820 he went to Switzerland, and engaged in teaching. About this time he became known as a writer of poems and literary criticisms. His first publication was his *Streckverse* (Heidelberg, 1823). In 1825 he established himself at Stuttgart. After the revolution of 1830 he zealously opposed French political and literary influence in Germany, and was repeatedly elected to the Würtemberg diet. Börne satirized him in his *Menzel der Franzosenfresser*. He edited for many years the *Literaturblatt* of Stuttgart, gave it up in 1848, but revived it in 1852, and made it an organ of reactionary policy in civil and ecclesiastical affairs. Besides the writings mentioned above, he published *Geschichte der Deutschen* (3 vols., Zürich, 1824-'5; translated into English by G. Horrocks, London, 1849); *Die deutsche Literatur* (Stuttgart, 1828; translated into English by C. C. Felton, in Ripley's "Specimens of Foreign Literature," Boston, 1840); *Rübezahl* (1829); *Narcissus* (1830); *Reise nach Oesterreich* (1831); *Reise nach Italien* (1835); *Taschenbuch der neuesten Geschichte* (5 vols., 1829-'33); *Geist der Geschichte* (1835); *Europa im Jahre 1840* (1839); *Mythologische Forschungen und Sammlungen* (1842); *Die Gesänge der Völker* (1851); *Eufore*, a novel descriptive of scenes of the thirty years' war (Leipsic, 1851); *Geschichte Europas von 1789-*

1815 (2 vols., Stuttgart, 1853); *Geschichte der letzten 40 Jahre* (2 vols., 3d ed., 1865); *Preussen und Oesterreich im Jahre 1866* (1866); *Geschichte des französischen Krieges von 1870* (1871); *Rom's Unrecht* (1871); *Geschichte der neuesten Jesuitenumtriebe in Deutschland 1870-72* (1873); and *Kritik des modernen Zeitbewusstseins* (2d ed., 1874). His library was purchased by the German government in 1874 for the university of Strasburg.

MEPHISTOPHELES, in old popular legends, the familiar spirit of the magician Faust, the second of the fallen archangels, and the most powerful chief of the infernal legions after Satan. The name is by some derived from the Greek *μη*, not, *φως*, light, and *φιλος*, loving. He is chiefly known as the malignant, scoffing fiend of Goethe's "Faust."

MEQUINEZ, or **Miknas**, a city of Morocco, in the province of Fez, near the Seboo, 36 m. W. S. W. of Fez; pop. about 70,000. It is situated in a valley of a mountainous district, and is surrounded with triple walls. Most of the houses are one story high, but are neat and substantial. The principal buildings are several mosques, a castle founded in 1674 by Sultan Muley Ismail, and a palace which is occasionally the residence of the sovereign, adorned with marble columns, fountains, and fine gardens. There are manufactures of painted crockery and leather. In the vicinity are large plantations of olives. There is an extensive trade at Mequinez in most of the products of the country.

MERCADANTE, **Saverio**, an Italian composer, born in Altamura in 1797, died in Naples, Dec. 18, 1870. At the age of 12 he entered the royal college of music at Naples, and studied the violin and flute, but soon devoted himself to the study of dramatic art and to composing for the voice. In 1818 a cantata of his composition was performed at the theatre Del Fondo, and for 25 years he wrote opera after opera with great rapidity, many of them meeting with no success. In 1833 he became chapelmaster at the cathedral of Novara. In 1836 his opera *I Briganti* was brought out at Paris, but failed even with such great singers as Rubini, Tamburini, Lablache, and Grisi. In 1840 he became director of the royal conservatory at Naples, but his sight failed him, so that in 1862 he became completely blind, and was obliged to dictate whatever he composed. Of his 40 odd operas *Il giuramento* is now best known.

MERCATOR, **Gerard**, a Flemish geographer, born at Rupelmonde, March 5, 1512, died in Duisburg, Dec. 2, 1594. He learned engraving, and Charles V. employed him on maps. In 1559 he was appointed cosmographer to the duke of Juliers and Cleves. He published descriptions and maps of Europe, France, Germany, the British isles, and the world. His method of laying down charts and maps, by a projection of the surface of the earth *in plano*, is still in use. The most important of his works are: *Chronologia a Mundi Exordio ad 1568* (Cologne, 1569); *Tubula Geographica ad Men-*

tem Ptolemæi restitutæ (1578); *De Creatione ac Fabrica Mundi*, a treatise prefixed to the uniform edition of his maps (1594); and *Atlas, sive Geographica Meditationes de Fabrica Mundi et fabricati Figura* (Duisburg, 1595).

MERCED, a central county of California, intersected by the San Joaquin river, and watered by the Merced and Mariposa, its tributaries; area, 1,975 sq. m.; pop. in 1870, 2,807, of whom 186 were Chinese. It is bounded W. by the Coast range. The soil is very fertile. It is traversed by the Visalia division of the Central Pacific railroad. The chief productions in 1870 were 218,162 bushels of wheat, 14,456 of Indian corn, 142,436 of barley, 13,830 of Irish and 11,330 of sweet potatoes, 231,072 lbs. of wool, 232,530 of butter, 229,298 of cheese, and 8,195 tons of hay. There were 2,362 horses, 49,531 cattle, 46,525 sheep, and 9,054 swine. Capital, Snelling.

MERCER, the name of counties in eight of the United States. **I.** A W. county of New Jersey, bordering on Delaware river; area, 260 sq. m.; pop. in 1870, 46,386. The surface is uneven, and somewhat elevated toward the N., and the soil is fertile. It is traversed by the New Jersey, the Camden and Amboy, the Belvidere and Delaware, and the Mercer and Somerset railroads, and the Delaware and Raritan canal. The chief productions in 1870 were 149,238 bushels of wheat, 545,547 of Indian corn, 428,143 of oats, 222,207 of potatoes, 17,516 lbs. of tobacco, 25,425 of wool, 500,342 of butter, and 28,767 tons of hay. There were 4,464 horses, 6,801 milch cows, 3,529 other cattle, 9,384 sheep, and 6,733 swine; 4 manufactories of agricultural implements, 1 of freight and passenger cars, 21 of men's clothing, 4 of ground coffee and spices, 1 of cotton goods, 3 of woolen goods, 1 of drugs and chemicals, 65 of wagon materials, 3 of India-rubber and elastic goods, 5 of forged and rolled iron, 2 of nails and spikes; 6 of iron castings, 7 of machinery, 1 of lead and zinc, 9 of sash, doors, and blinds, 14 of stone and earthen ware, 1 of wire work, 8 saw mills, and 15 flour mills. Capital, Trenton. **II.** A W. county of Pennsylvania, bordering on Ohio, drained by the Shenango and several smaller creeks; area, 624 sq. m.; pop. in 1870, 49,977. The surface is undulating and the soil fertile. Extensive coal mines are found, also iron and limestone. It is traversed by the Atlantic and Great Western railroad, the Erie and Pittsburgh, the Shenango and Allegheny, and the Franklin division of the Lake Shore; also by the Beaver and Erie canal. The chief productions in 1870 were 341,922 bushels of wheat, 24,850 of rye, 639,743 of Indian corn, 883,965 of oats, 68,625 of buckwheat, 149,124 of potatoes, 618,422 lbs. of flax, 246,639 of wool, 1,516,067 of butter, 101,530 of cheese, and 58,422 tons of hay. There were 11,390 horses, 15,570 milch cows, 18,489 other cattle, 68,038 sheep, and 15,414 swine; 38 manufactories of carriages and wagons, 1 of dressed flax, 3 of forged and rolled iron, 2 of

nails and spikes, 15 of iron castings, 9 of machinery, 13 tanneries, 3 breweries, 52 saw mills, 9 planing mills, 20 flour mills, and 5 woollen mills. Capital, Mercer. **III.** A S. county of West Virginia, bordering on Virginia, bounded E. by the Kanawha and intersected by Blue-stone river; area, 540 sq. m.; pop. in 1870, 7,064, of whom 394 were colored. A range of the Alleghanies extends along the N. W. border. The chief productions in 1870 were 25,-756 bushels of wheat, 5,597 of rye, 114,746 of Indian corn, 43,184 of oats, 10,867 of potatoes, 117,429 lbs. of tobacco, 18,713 of wool, 109,-355 of butter, and 2,517 tons of hay. There were 1,667 horses, 2,722 milch cows, 3,195 other cattle, 8,293 sheep, and 6,854 swine. Capital, Princeton. **IV.** A central county of Kentucky, bounded N. E. by Kentucky river, and E. by Dick's river, and drained by the head waters of Salt river; area, 240 sq. m.; pop. in 1870, 13,144, of whom 3,310 were colored. The surface is undulating and the soil fertile. The chief productions in 1870 were 146,534 bushels of wheat, 23,941 of rye, 495,775 of Indian corn, 66,001 of oats, 14,551 of potatoes, 33,584 lbs. of wool, 123,042 of butter, and 2,992 tons of hay. There were 3,733 horses, 2,220 milch cows, 3,753 other cattle, 7,694 sheep, and 18,349 swine; 3 manufactories of carriages and wagons, 2 of woollen goods, 1 saw mill, and 2 flour mills. Capital, Harrodsburg. **V.** A W. county of Ohio, bordering on Indiana, drained by the St. Mary's and Wabash rivers and branches; area 576 sq. m.; pop. in 1870, 17,254. It has a level surface heavily timbered, and a fertile soil. The chief productions in 1870 were 338,189 bushels of wheat, 341,775 of Indian corn, 244,289 of oats, 34,298 of potatoes, 12,589 of flax seed, 94,742 lbs. of wool, 373,956 of butter, and 16,527 tons of hay. There were 5,518 horses, 5,816 milch cows, 6,765 other cattle, 26,669 sheep, and 24,496 swine. Capital, Celina. **VI.** A N. W. county of Illinois, separated from Iowa by the Mississippi; area, 550 sq. m.; pop. in 1870, 18,768. There are extensive prairies in the county, and it is heavily timbered along the banks of the Mississippi; the soil is fertile. The Galva and Keithsburg branch of the Chicago, Burlington, and Quincy railroad passes through it. The chief productions in 1870 were 302,494 bushels of wheat, 40,778 of rye, 2,054,962 of Indian corn, 452,889 of oats, 94,241 of potatoes, 52,-088 lbs. of wool, 376,727 of butter, and 28,180 tons of hay. There were 10,984 horses, 7,655 milch cows, 15,552 other cattle, 11,278 sheep, and 41,663 swine; 13 manufactories of carriages, 7 of saddlery and harness, 9 flour mills, and 1 saw mill. Capital, Alledo. **VII.** A N. county of Missouri, bordering on Iowa, and drained by Weldon river; area, 530 sq. m.; pop. in 1870, 11,557, of whom 93 were colored. It has an undulating surface and fertile soil. It is traversed by the Chicago, Rock Island, and Pacific railroad. The chief productions in 1870 were 69,068 bushels of wheat, 472,780 of Indian

corn, 160,081 of oats, 42,969 of potatoes, 17,550 lbs. of tobacco, 57,000 of wool, 234,074 of butter, and 11,662 tons of hay. There were 5,153 horses, 4,416 milch cows, 8,342 other cattle, 25,441 sheep, and 19,627 swine. Capital, Princeton. **VIII.** A N. W. county of Dakota, bounded N. and E. by Missouri river; area, about 900 sq. m. It is intersected by the Big Knife and other affluents of the Missouri. It has been recently formed, and is not included in the census of 1870. The surface is rolling, and the soil moderately fertile.

MERCER, Hugh, an American revolutionary soldier, born in Scotland about 1720, died near Princeton, N. J., Jan. 12, 1777. He was educated as a physician, and served as a surgeon's assistant in the army of the young pretender at Culloden. He soon after settled in Virginia, and in 1755 served in the French and Indian war and volunteered in the expedition led by Braddock to Fort Duquesne. At the battle of Monongahela, July 9, he was wounded in the shoulder, and wandered alone through the wilderness to Fort Cumberland, 100 m. distant. He returned to his practice, and was residing in Fredericksburg at the outbreak of the revolution, when he was commissioned colonel of one of the regiments authorized in 1775 by the Virginia convention, and through the influence of Washington obtained the rank of brigadier general with the command of the flying camp organized in the spring of 1776. He accompanied Washington on his retreat through New Jersey, and rendered valuable assistance at the battle of Trenton. In the succeeding action at Princeton he led the vanguard, composed principally of militia. His men beginning to waver before the attack of the enemy, he made an energetic attempt to rally them, and was felled to the ground by a blow from the butt end of a musket. Though surrounded by British soldiers, he rose and defended himself with his sword, refusing quarter, and after a brief struggle, in which he was repeatedly bayoneted, was left for dead upon the field. He was removed soon after the battle to a house in the neighborhood, where about a week afterward he died. His corpse was followed to the grave in Philadelphia by upward of 30,000 people. In November, 1840, a monument to his memory was dedicated at the Laurel Hill cemetery. Provision was made by congress for the education of his youngest son.

MERCERSBURG, a borough of Franklin co., Pennsylvania, at the terminus of a branch of the Cumberland Valley railroad, 15 m. S. W. of Chambersburg and 62 m. S. W. of Harrisburg; pop. in 1870, 971. It is the seat of Mercersburg college (Reformed), organized in 1865, and having in 1873-'4 6 professors, 3 tutors, 50 preparatory, 45 collegiate, and 6 theological students, and a library of 2,000 volumes. The theological department was organized in 1872. Marshall college and the theological seminary of the Reformed church, formerly situated here, have been removed to

Lancaster, the former in 1853 and the latter in 1871. The college was merged with Franklin college, and is now known as Franklin and Marshall college.

MERCHANT, Commission. See FACTOR.

MERCIA, the largest kingdom of the Saxon heptarchy in the island of Britain. The name is derived from *mark*, meaning frontier, as this was the most western of the three kingdoms of the Angles. It was situated inland, being bounded N. by Cambria and Northumbria, E. by East Anglia and Essex, S. by Wessex, and W. by Wales, and included the modern counties of Chester, Derby, Nottingham, Lincoln, Salop, Stafford, Leicester, Rutland, Northampton, Huntingdon, Hereford, Worcester, Warwick, Gloucester, Oxford, and Buckingham, and parts of Hertford and Bedford. It was founded by Crida, an Angle, about 585, was subject for a time to the Northumbrians, and afterward subdued East Anglia and Kent. Its more important kings were Penda, Ethelred, Kenred, and Wiglaf, who was finally conquered by Egbert, king of Wessex, in 827.

MERCK, Johann Heinrich, a German scholar, born in Darmstadt, April 11, 1741, died June 27, 1791. He officiated in various public functions in his native town, translated Addison's "Cato" and other works from the English, cooperated with Lavater in the publication of his work on physiognomy, and took an active part in the *Frankfurter gelehrte Anzeigen*, *Deutscher Merkur*, and other leading periodicals, and in various other literary enterprises. His select works were edited long after his death by Stahr, and published in Oldenburg in 1840. He is chiefly remembered in German literature on account of his intimate association with Goethe, Herder, and other eminent men, upon whose intellectual development he exerted a great influence by his literary criticism. The latter part of Merck's life was saddened by domestic and pecuniary misfortunes, which led him to shoot himself. The letters addressed to him by Goethe, Herder, Wieland, and others, were published by Wagner (Darmstadt, 1835); and another edition of his correspondence, including both letters received and written by him, appeared in 1838.

MERCURY, or **Quicksilver**, a metal of the color and lustre of silver, and fluid at ordinary temperatures, whence its ancient name of *argentum vivum*, and that by which it was called by Aristotle and Theophrastus, who made the earliest mention of it, ἀργυρος χυρός, fluid silver. It was also known as *hydrargyrum*, and from this its chemical symbol, Hg, is derived. The equivalent of the metal is 200; and its specific gravity, which varies somewhat with the temperature, is given by Kopp as 13.557 at 62.6° F. At 39° or 40° below zero F. the metal becomes solid and crystallizes in regular octahedrons, contracting in bulk and assuming the density of 14; the mass is malleable, and resembles lead. Its boiling point is 662° F., at which it forms an invisible, transparent vapor,

the density of which is 6,976, air being 1,000. Before assuming this form, if exposed to the air at high temperatures, it absorbs oxygen and is converted into the red oxide, which is decomposed at the boiling point. Above 40° F. mercury is somewhat volatile, as may be shown by holding an iodized daguerreotype plate, that has been submitted to the action of light in the camera, over a bath of mercury, when the picture will be brought out by the vapor. Gold leaf is also affected by the vapor when suspended in a vial containing mercury and kept at ordinary temperatures. Strong nitric acid dissolves mercury; but hydrochloric acid, hot or cold, does not affect it. It is oxidized by heated concentrated sulphuric acid, and is soluble in a solution of common salt. Exposed for a long time to the air, mercury gathers a film of gray oxide upon its surface, which adheres to the glass in which the metal is contained; glycerine is employed to prevent the formation of this film. When mercury contains dissolved in it lead, zinc, or other extraneous oxidizable metals, these may be removed by covering the surface of the metal, placed in a shallow vessel, with dilute nitric acid, and stirring frequently. The acid attacks and takes up the foreign matters, and may also form a crust of nitrate with a small portion of the mercury. This is a more efficient method of purification than that of distillation when zinc is present, as this is distilled over with the mercury. Impurities mechanically mixed with mercury may often be removed by straining the metal through paper perforated with a very small hole, or squeezing it through wash leather. But if a film of oxide still adheres to the mercury, this may be removed by agitating it violently in a bottle in which some powdered white sugar has been introduced, then blowing air into the bottle, repeating the shaking and blowing several times, and then filtering. Mercury unites with various metals, as gold, silver, tin, lead, zinc, and bismuth, forming compounds which are noticed under the head of **AMALGAM**. In some cases the cheapest of the metals named have been used to adulterate mercury. The effect of this mixture is to produce an amalgam, the presence of which is easily detected by the fluid, when poured upon a plate of glass or porcelain, not flowing freely, but leaving a trace behind it.—Mercury occurs native in globules scattered through masses of rocks or ore, and also (rarely) in the form of a silver amalgam; but chiefly as a sulphide of mercury. (See CINNABAR.) It seldom if ever occurs in fissure veins, though sometimes it impregnates or constitutes well defined deposits. It is found in geological formations of almost all ages, and particularly in talcose and argillaceous slates. The most important deposit in the world is that of Almaden in Spain, from which, according to Pliny, the Romans annually obtained about 700,000 lbs. of cinnabar. The matrix of the ore consists of quartz and quartzose sandstone, intermixed with cinnabar in

beds or intercalated veins, enclosed in slates and quartzites of upper Silurian age. A mass of ore nearly 100 ft. wide, called *el Rosario*, constitutes the largest development. The Spanish government holds the title and has leased the mines to the Rothschilds. The average yield of all the ore is about 7.85 per cent. (See ALMADEN.) The annual production of the Spanish mines was estimated in 1867 at about 2,500,000 lbs. At Idria, in Illyria, cinnabar occurs impregnating beds of limestone of uncertain age. (See IDRIA.) These mines are controlled by the government, and the product in 1871 was 750,400 lbs., and about 123,200 lbs. of artificial cinnabar. The material is very soft, sometimes contains globules of mercury, and gives off mercurial fumes which injure the health of the workmen. In the Palatinate quicksilver ores are found at moderate depths distributed in the fissures of the rock apparently by sublimation. At Ripa, in Modena, cinnabar impregnates micaceous and talcose slates. At Vall' Alta, in Venetia, it occurs in the calcareous schists and in quartzose porphyry. Native mercury is found at Montpellier in France, disseminated through tertiary marls and calcareous conglomerate. In Chili cinnabar is found in granitic rocks, and in Peru in sandstone associated with coal. The great Peruvian mines of Huancavelica were worked as early as 1566. The product down to 1845 was about 1,100,000 quintals of mercury (101.60 lbs. each). Of this only 66,000 quintals were produced after 1789, up to which time Humboldt gives the production as 1,040,469 quintals, worth at the government price \$75,954,237. The present annual production of Peru probably does not exceed 200,000 lbs. Mercury is found at many localities in Mexico, but is not extracted at present on a large scale. The great consumption of this metal in the *patio* process at the *haciendas* or metallurgical works of Mexico is supplied by importations from Spain and California.—The deposits of New Almaden, 12 m. from San José, in Santa Clara co., California, occur in the Coast range, in a belt of altered cretaceous slates, between beds of serpentine on either side. The ore is found in a series of irregular cavities occurring without apparent connection or order. The average yield of the ore worked in 1873 at New Almaden was 7.86 per cent. quicksilver; a large amount (something more than one half) of the material reduced in that year was *tierras* or poor earthy screenings, yielding 2 per cent. This reduced the general average to 4.87 per cent. The product of this property for 21½ years, ending Dec. 31, 1873, was as follows:

New Almaden mine.....	578,150	flasks, or	43,845,975	lbs.
Enriquita "	10,371	" or	803,681	"
Total.....	588,521	flasks, or	44,654,656	lbs.

(A flask contains 76½ lbs.) The deposit at New Almaden was first found by Indians, who used the material as a paint, and excavated openings 50 or 60 ft. into the mountain in search of it.

In 1824 and afterward the Spaniards attempted to work it for silver. In 1845 it was worked first for mercury by Capt. Castellero. Operations were suspended during the war, and recommenced in 1848, and a company of Mexicans and English held the mine from 1850 to 1858, when they were enjoined, pending litigation as to title. The value of the product up to this time had amounted, according to legal papers, to over \$8,000,000, and was estimated at \$1,000,000 annually. The total value of the New Almaden property was rated by the United States attorney general at \$15,000,000. In the same neighborhood the Enriquita, Providencia, and Guadalupe mines have been worked. In Fresno county the New Idria series of mines, including the San Carlos, Aurora, Idria, Molino, Washington, Benada, and Victorener mines, contain cinnabar in sandstone and slate. The Panoche Grande, in this county, is famous in the records of litigation and legislation as the McGarrahan claim. The Redington mine in Lake county is similar in formation to the New Almaden. The decrease of late years in the production of quicksilver in California, and the consequent rise in price, have led to numerous discoveries and new openings of mines in that state. The producing mines in 1873 are given as follows: New Almaden, 11,042 flasks; New Idria, 7,600; Redington, 4,200; Great Western, 651; Manhattan, 621; Summit, 75; American, 128; Napa, 199; California, 995; Phoenix, 880; Washington, 197. As the price of quicksilver had risen by the end of the year to \$1.20 per pound, and had averaged during the year something over \$1 per pound, the product of California in 1873 may be valued at more than \$2,000,000. In quantity the production was less than that of previous years. California yielded in 1867, according to the reports of the Paris exposition, 3,960,000 lbs., out of a total for all countries of 7,083,120 lbs.—The methods employed in mining quicksilver ores present no peculiar features, except those which are incident to the great irregularity of the deposits. The theory of the reduction of the ores is simple. Pure cinnabar contains 13.79 parts of sulphur to 86.21 of quicksilver. The general average of the ores extracted is, however, less than 10 per cent. of quicksilver; in the majority of the deposits in California not over 2 per cent. Even much poorer ore than this is worked in other parts of the world. The difference in the grade of ore depends upon the proportion of intermixed gangue or sterile rock. The cinnabar itself is usually nearly pure. In treating it, the sulphur must first be separated from the quicksilver, and then, since in this process the quicksilver is vaporized, its metallic fumes must be recondensed. Two systems are employed. By the first the powdered ore is heated in retorts with 50 per cent. of its weight of lime or iron filings. The sulphur combines with the lime or iron, forming a non-volatile sulphide, setting free the mercury, the fumes of which

are then passed into condensers. By the second system the ore is burned in furnaces, where the sulphur is converted into sulphurous acid gas by the admission of air, and the quicksilver is set free as a vapor. All the vapors and gases from this combustion pass into condensing chambers, where the quicksilver is condensed, while the gases escape to the chimney. The retort system, although less wasteful in quicksilver, involves so much additional expense that it is not advantageous in practice. The roasting of cinnabar in furnaces is now universal. The furnaces used are of two general classes, intermittent and perpetual. In the former, a large charge is introduced, burned, and withdrawn when it has become cool, leaving the furnace ready for another. In a perpetual furnace small charges are continually introduced at stated intervals, and the burned ore is withdrawn without interrupting the process. Intermittent furnaces of different varieties are used at Almaden, Idria, and some points in California. A Spanish furnace at Almaden is peculiar in its system of condensation, by which the quicksilver is distilled in large numbers of clay crucibles joined together like pipes. The condensing chambers contain 528 of these in 12 rows of 44 each. Each *Aludel*, so called, is about 18 in. long, 10 in. wide in the middle, and 6 in. wide at each end, where it fits into the next. A small hole in each allows the condensed quicksilver to flow out into a gutter leading to a central channel. The furnace consists of a cylindrical shaft about 6 ft. in diameter and 25 ft. high, divided by perforated arches, 9 or 10 ft. from the top, into two compartments, the upper being for ore and the lower for fuel. The process of burning and distilling quicksilver lasts three days. On the fourth day the furnace is recharged, and the *Aludeln* are taken up, emptied, and rearranged. The furnace used at Idria has a series of brick chambers separated by partition walls for condensing the quicksilver. The intermittent furnaces of California are also provided with brick condensers. The power which bricks have of retaining heat is one of the greatest objections to their use; another is the inevitable loss of quicksilver, which forces its way even through the best made bottoms of condensing chambers, and through imperceptible cracks in the walls. The furnaces of California are built upon arches, and near the bottom of these arches pieces of sheet iron are placed in the masonry, which catch the quicksilver as it filters through, and conduct it to a basin. The merit of brick condensers as compared with iron lies in their ease of construction and repair, and in their indifference to the sulphuric acid which is formed with the sulphurous acid gases in contact with steam and oxygen. The intermittent furnaces at New Almaden are 40 ft. long, 8 ft. wide, and 10 ft. high, each being divided into compartments, the fire occupying one at the end, and the heat passing through the ores into flues. A charge of 15,000

lbs. is worked in 60 hours with wood fuel. A flue from the furnace passes upward to the first condensation chamber, which is 8 ft. long, 4 ft. broad, and 5 ft. high. The chambers are covered with cast-iron plates luted down. After passing through eight chambers the remaining vapors are conducted into a tank, where they are sprinkled with water, and thence escape by wooden chimneys. The ore is usually so mixed for treatment as to present a uniform low percentage. The finer fragments are worked up with the soft loamy portion, and the mass is kneaded with water and moulded into bricks, which being dried in the sun are worked like the rest. A great saving of fuel may be effected by the use of perpetual furnaces, or of kilns such as are employed for roasting iron ore or lime. Of this class are the Alberti furnace, which is a reverberatory, and hence suitable for small-sized pieces only; the Hühner, Pult, and Vall' Alta, which are shaft furnaces employed in Europe; and the furnaces of Riotte, Knox, and Pershacker, which are California improvements. Cast-iron, wooden, or wooden and sheet-iron tanks, or iron tubes, are employed as condensers. Draft is obtained by means of suction fans. From 20 to 24 tons of ore is passed through a perpetual furnace daily, every ton remaining in the furnace nine hours above the fire bridge, and an additional time of three to four hours below the fire bridge in the hottest portion of the furnace, where the last particles of quicksilver are expelled. The great subtlety with which the vapors of this metal penetrate through the minutest openings is well known to workmen at quicksilver furnaces. Beneath the old furnaces at New Almaden 2,000 flasks were recovered by washing out the ground to a depth of 30 ft. The men and animals employed about the smelting works are subject to salivation and other injurious effects; and the same is true of mines where, as at Idria, native mercury occurs in the ores, and the atmosphere is contaminated with mercurial fumes. At New Almaden there has been little or no complaint among the miners.—Metallic mercury in its usual form has no action upon the human system; it has been taken with impunity in quantities of a pound weight; but in vapor it acts energetically, producing its constitutional effects. Poisoning occasionally results from exposure to the vapor of mercury, as from the breaking of packages in the hold of a ship, or in various processes in the arts, as in gilding, in silvering mirrors, &c. Mercury is used in medicine in many forms, all of which may give rise to its constitutional effects, varying in the time required for the production of their action and in the nature of the local disturbance they produce. Mercury with chalk, or *hydrargyrum cum creta*, prepared by rubbing up 3 oz. of mercury with 5 oz. of prepared chalk, and blue pill made from a mass composed of 1 oz. of mercury rubbed up with 1½ oz. of confection of roses, and then beaten with ¼ oz. of powdered liquorice root, are

preparations in very frequent use. The metal should be contained in them in a state of division so fine that its globules are not made visible by a lens magnifying four diameters or more. A small portion of oxide is probably present in them also, which is more soluble than metallic mercury, and thus renders the preparations more active. When blue pill is taken in small but repeated doses, the first appreciable effect is usually an increased activity of the secretions, particularly of the intestinal canal, the discharges from which become liquid and bilious; the mucous membrane of the lungs and genito-urinary apparatus may display a similarly augmented secretion. If there happen to be anywhere an interstitial deposit of fibrine, or an exudation of lymph, or effusion of serum, its absorption may now be promoted; although Stillé says if the mercurial influence be carried too far, extensive ulcers will appear, sometimes coated with false membranes or exudations, and the eyelids and ankles may become œdematous, and even general dropsy may ensue. In the next grade of the unfavorable action of mercury the appetite fails, digestion is impaired, the secretions become still thinner and more copious, the firmness of the tissues diminishes, newly formed callus is dissolved, and recently healed wounds open afresh; the muscles waste, the skin has an earthy paleness, with the other consequences mentioned above. These symptoms, says Stillé, appear to depend upon the radical change which the blood has undergone by losing a large portion of its natural solid constituents, and perhaps a formation of less highly vitalized compounds of albumen with the mercurial salt. Salivation is one of the most ordinary effects of the continued use of mercury, and consists in a copious flow of watery saliva, accompanied with swelling and soreness of the gums and a peculiar fetor of the breath. Ulcerations of the mouth may occur. The power of mercury to increase the secretion or discharge of bile, which for many years has been one of the most undoubted articles of medical faith, has recently been called in question; but although it can be shown clearly enough that in certain dogs the secretion of bile is not increased thereby, yet there seems to be not only clinical but experimental evidence to show that, in some way or other, the flow of bile into the intestine is rendered more copious by mercurial action. The constitutional action of most of the other mercurial preparations resembles that first described. Calomel (technically called *hydrargyri chloridum mite*) is often given as a cathartic, and when so given produces no constitutional action whatever, except in persons who are endowed with a peculiar and exceptional sensitiveness to its action. Corrosive sublimate is an irritant poison even in quite small doses, but when given in doses of $\frac{1}{10}$ to $\frac{1}{12}$ of a grain it is one of the best forms in which to use the drug for its systemic action. Turpeth mineral, which is a

basic sulphate, is used as an emetic, and only exceptionally is absorbed in sufficient quantity to produce constitutional effects. Inunctions with mercurial ointment and fumigations with the bisulphuret or other salts may also introduce the metal into the system and give rise to the effects above described. Both calomel and corrosive sublimate have been injected subcutaneously, but when administered in this way are liable to produce abscesses. Mercurial fever and mercurial tremors, the latter often an extremely obstinate affection, are among the constitutional effects of mercury. Stillé says: "Few medicines produce such a marked sense of depression, both mental and bodily, as mercury even in ordinary doses; but when the system is brought thoroughly under its influence, these effects become distressing; the susceptibility to external impressions, and particularly to that of cold, is augmented, pains in the limbs are felt, slight annoyances disturb the equanimity, and sometimes mental debility ensues, so that a moody melancholy and fear of death may overtake the patient." The statements in regard to the resemblance of lesions induced by mercury to those of the later stages of syphilis are probably exaggerated, as the symptoms of mercurial poisoning, however severe they may be, are not, so far as can be ascertained by examining workmen in establishments where mercury is used and mercurial poisoning familiar, the same as those of syphilis.—It is impossible to give in any reasonable space an account of the uses which have been made of mercury in various diseases. It is much less used now than formerly, and its marked constitutional effects when it is employed are avoided, if possible, rather than sought for. It is most largely employed in the treatment of syphilis, but it can be shown that even here it is not absolutely essential, although surgeons of great experience are confident that the disease is rendered shorter and more manageable thereby. The general verdict of the medical profession is undoubtedly in favor of using mercury in the treatment of syphilitic disease, but of limiting its use to appropriate cases. It should not be administered indiscriminately in syphilitic any more than in other affections. In tertiary syphilis it should be used with great caution, if at all. It is given most advantageously in the primary, secondary, and hereditary forms of the disease, when these occur in individuals whose constitutions are capable of bearing the action of the drug. Whenever inflammation, especially of serous membranes, is accompanied with exudation, the careful administration of mercury is often of advantage in promoting absorption of the exudation.—Mercury is a dyad, and forms two sets of compounds, the mercurous and mercuric salts; there are two oxides, mercury monoxide or mercuric oxide, HgO , and mercurous oxide, Hg_2O . When mercuric oxide is prepared by decomposing the ni-

trate by heat, it has a bright orange color, and is known as the red oxide of mercury. In the state of a finely levigated powder, or as an ointment, this is applied externally in medicine as a stimulant and caustic. The name red precipitate, or precipitate *per se*, was given to this oxide because of the manner in which it was formerly prepared. Mercury in a matrass (a glass vessel with a long narrow neck) was subjected continuously to the action of heat. The mercurial vapor rising in the neck of the matrass was converted into red oxide, which was prevented from escaping; and as the operation went on for weeks, the whole was converted into the same compound. Other mercurial compounds of especial interest are the subchloride and chloride, the one described under CALOMEL and the other under CORROSIVE SUBLIMATE.—In the arts, mercury is employed in the construction of philosophical instruments, and is preferred to other fluids for filling thermometers and barometers by reason of the great range of temperature through which it expands or contracts uniformly with equal increase or decrease of heat. Its amalgam with tin is largely used for coating or “silvering” the backs of mirrors. The paint, vermilion, is its sulphuret, cinnabar. But its principal consumption is in the extraction of silver and gold from their ores in the amalgamating process. (See AMALGAMATION.)

MERCURY, or **Hermes**, an ancient deity of the Greeks and Romans. According to the Greek legend, he was a son of Jupiter and Maia, a daughter of Atlas. He was born in a cave of Mt. Cyllene, in Arcadia, whence his epithet Cyllenian. Soon after his birth, escaping from his cradle, he went to Pieria, and stole several of Apollo's oxen, which he drove to Pylos, where he slaughtered two for a banquet and sacrifice, and concealed the rest. On returning to Cyllene, he found a tortoise at the entrance of his cave, of whose shell and some of the ox intestines he constructed the first lyre. Apollo, knowing who had stolen his cattle, went to Cyllene to demand restitution; and when Mercury denied the theft he took him before Jupiter, who obliged him to confess. But when Apollo heard Mercury perform on the lyre, he was so delighted that he permitted the young musician to retain the cattle, and presented to him his golden *caduceus*, or pastoral staff, teaching him at the same time the art of prophesying with dice. Jupiter appointed him herald general of the gods, in which capacity he was frequently the medium of communication between mortals and immortals. It was he who conducted Priam to Achilles, when the venerable monarch went to beg the body of Hector from his conqueror. He bound Ixion to the wheel for boasting of intimacy with Juno, chained Prometheus to the Caucasus, and escorted Juno, Venus, and Minerva to Mt. Ida to submit their charms to the judgment of Paris. Mercury was esteemed the author of various inventions, and

the origin of letters, numbers, astronomy, music, military tactics, gymnastics, weights, and measures was ascribed to him. He was also regarded as the god of eloquence, the presiding deity of the gymnasia, and the patron of fraud and perjury. The original seat of his worship was Arcadia, whence it gradually spread over the Grecian world. His festivals were called *Hermaia*. The most celebrated of his temples was that on Mt. Cyllene. The principal things sacred to him were the palm tree and the tortoise. He is generally represented as a young man with a broad-brimmed hat adorned with wings, in his right hand a herald's staff or a sceptre, and on his feet a pair of winged sandals.—In Rome, Mercury was the god of commerce and diplomacy. The *etyma* of his name, *merx* and *curius*, clearly indicate his predominant function. A temple was raised to him in Rome near the Circus Maximus as early as 495 B. C., and an altar of his stood contiguous to the Porta Capena. Under the cognomen of Malevolus, or the “ill-disposed,” he had a statue in the *vicus sobrius*, or Sober street, in which no wine shops were allowed to be kept, and there milk was the sole beverage offered to him. This statue held a purse in one of its hands as a symbol of his commercial functions. The festival of Mercury was celebrated on the 25th of May, which was regarded as a high day by the Roman merchants. After the various relations of Greece and Rome had become intimate, the Hermes of the former and the Mercurius of the latter were popularly considered identical, though the resemblance between the two divinities was very slight, and was never admitted by the *fetiales*, or guardians of the public faith of Rome.

MERCURY, the planet nearest to the sun, travelling at a mean distance from it of about 35,392,000 m. The eccentricity of the orbit of Mercury is considerable, the centre of the orbit being more than 7,000,000 m. from the centre of the sun. Thus his greatest distance from the sun amounts to about 42,669,000 m., his least to about 28,115,000 m. When nearest to the earth, Mercury's distance from us amounts to about 45,000,000 m.; but when so situated he is not visible, because, being between us and the sun, his darkened hemisphere is turned toward us. His greatest distance amounts to about 135,500,000 m. When he is at his greatest distance his illuminated face is turned directly toward the earth; but he cannot then be seen because he lies in the same direction as the sun, and is lost in the superior glory of that luminary. He is seen most favorably when nearly at his greatest elongation; that is, when two lines drawn to the sun and Mercury include their greatest angle. At such a time he is about 85,000,000 m. from us, and appears as a half disk. As he is illuminated with great brilliancy on account of his nearness to the sun, he is a difficult object of telescopic study, the more so that when most favorably situated the illuminated portions of his disk are seen obliquely.

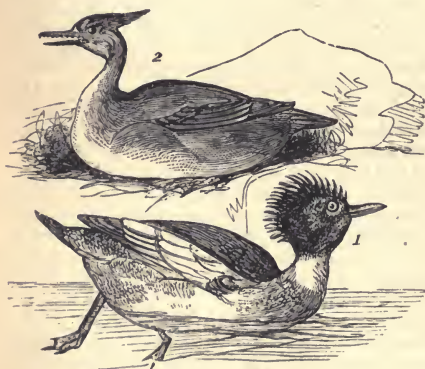
Therefore very little reliance can be placed on the accounts some telescopists have given of marks supposed to be seen on the planet's surface, nor can his rotation period be regarded as fully determined from features so unsatisfactorily observed. Even the estimates of his diameter can scarcely be regarded as altogether trustworthy; but it is not probable that it greatly exceeds or falls short of 3,000 miles. His volume is about $\frac{1}{1000}$ of the earth's, and his density greater than hers in about the proportion of 10 to 9; so that his mass is about $\frac{1}{100}$ of the earth's. He travels round the sun in rather less than three of our months, his mean sidereal revolution being completed in 87.9693 days. His mean synodical revolution, or the mean interval between his successive returns to inferior conjunction, amounts to 115.877 days; so that he passes through all his phases (from inferior conjunction to maximum elongation west of the sun, thence to superior conjunction through maximum elongation west of the sun, to inferior conjunction again) more than three times in the course of each year. But as he is only visible for a short time after sunset on three or four evenings when his elongation is easterly, and for a short time before sunrise on three or four mornings when his elongation is westerly, he is not often seen. In America he might be seen oftener than in England, however, as the twilight skies are seldom free from light mist in the latter country. It is commonly said that Mercury rotates on his axis in 24h. 5m. 28s.; but great doubt rests on the determination of this element, for the reason above mentioned.—Mercury, travelling within the earth's orbit, sometimes transits (or passes across) the face of the sun. The first phenomenon of this sort ever observed took place in November, 1631, and was witnessed by Gassendi. A transit of Mercury is not so important in astronomy as a transit of Venus, because the nearness of Mercury to the sun prevents his having a measurable relative parallax; in other words, whereas Venus, seen from two distant stations on the earth during any moment of her transit, is projected at two spots measurably separated from each other on the sun's disk, this is not the case with Mercury. The observation of Mercury in transit, however, is interesting as illustrating the phenomena which occur during a transit of Venus. The formation of the "black drop," a small black ligament which at the moment of contact seems to connect the disk of the planet with the dark space outside the solar disk, is very manifest in the case of Mercury, though, owing to his disk being so much smaller than that of Venus, and his motions more rapid, the phenomena are not so readily studied. Transits of Mercury take place at intervals of 13, 7, 10, 3, 10, and 3 years.

MERCY, Sisters of, or Order of Our Lady of Mercy, a religious order founded in Dublin by Miss Catharine McAuley in 1830. Miss McAuley was born in Gormanstown castle, near

Dublin, Sept. 29, 1787, and died Nov. 13, 1841. Her parents, who were Roman Catholics, died while she was a child, and she was brought up without any definite religious faith. But she became a Roman Catholic, and devoted herself and her large fortune to the service of the poor. She induced several ladies to join her, purchased a house in Dublin, and there in 1827 opened an asylum for destitute young women and a free school for poor children. Soon afterward she and her companions underwent a regular novitiate in a convent of Presentation nuns, and in 1831 assumed there the habit and took the vows of the new order. The rules first drawn up were sanctioned by the archbishop of Dublin, Jan. 23, 1834; but subsequently the rule of St. Augustine, modified to suit the active duties of the sisterhood, was adopted by them, approved by Gregory XVI. in 1835, and formally confirmed by him in 1840. The sisters of mercy spread rapidly over Great Britain and her colonies. The first American house was established at St. John's, Newfoundland, in 1842, and the first in the United States at Pittsburgh in 1843. In 1874 the order possessed houses of protection for servant girls, schools, asylums, and hospitals in all the New England, middle, and western states, including California and Washington territory, and in nearly all the southern states.—The sisters of mercy have in view, besides other charities, the visitation of the sick and prisoners, the instruction of poor girls, and the protection of virtuous women in distress. Wherever their means permit they found "houses of mercy," where destitute girls of good character are cared for until employment can be found for them. They are subject to the bishops, and have no general superior, the communities of each diocese in the United States forming one body governed by a common superior, who is elected by the professed choir sisters, and confirmed by the bishop. The sisterhood is divided into two classes, choir sisters and lay sisters. The former are employed about the ordinary objects of the order, and the latter about the domestic avocations of the convent and such other duties as may be assigned to them. Candidates for membership of either class undergo a preliminary "postulancy" for six months; at the end of that time they assume the white veil and become novices. The novitiate lasts two years. The vows, which are taken for life, bind the members to poverty, chastity, obedience, and the service of the poor, sick, and ignorant. The habit of the order is a black robe with long loose sleeves, a white coif, and a white or black veil. In the streets a bonnet of black crape is worn instead of the coif and veil.

MERGANSER, a name applied to most of the saw-billed ducks, of the subfamily *merginæ*, of which the goosander, the largest species, has been described under that title. The bill is very slender, narrow, compressed, ending in

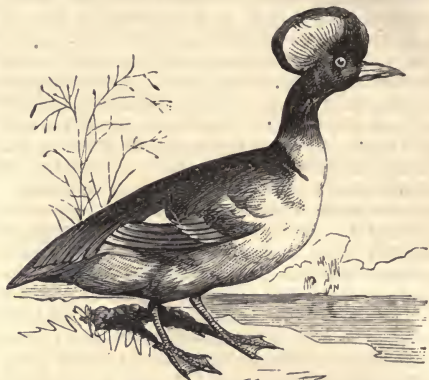
a conspicuous nail, with the edges serrated; tarsi much compressed, the scales largest anteriorly; and the tail feathers 18 in the North American species. In the genus *mergus* (Linn.) the bill is longer than the head, and mostly red, with the serrations conical, acute, and recurved; the tarsi about two thirds of the middle toe, tail about half the length of the wings, and head with a depressed crest. The red-breasted merganser (*M. serrator*, Linn.), sometimes called sheldrake in this country, is about 2 ft. long, with an extent of wings of 33 in., bill $2\frac{1}{2}$ in., and a weight of $2\frac{1}{2}$ lbs. In the male, the head and upper neck are dark green, the throat reddish brown with black streaks, sides finely barred with transverse black lines, feathers in front of wing white with black margins, white of wing crossed by two black bars, and under parts reddish white; head with conspicuous pointed crest; nostrils posterior. In the female, the upper parts are ash-colored, the lower reddish white, compressed crest chestnut



Red-breasted Merganser (*Mergus serrator*).
1. Male. 2. Female.

brown, black at base of secondaries exposed; outer tertials white, edged with black. This bird is distributed over the whole of North America and Europe, fishing chiefly in fresh water; it breeds in the middle and eastern states, and as far north as Labrador, beginning to build, according to latitude, from the first of March to the middle of May, among the rank grasses near fresh water; the nest is carefully made of dried weeds and mosses, and lined with down from the breast of the female; the eggs are from 6 to 10, $2\frac{1}{2}$ by $1\frac{1}{8}$ in., in shape like those of the domestic fowl, and of a uniform pale yellowish cream color; the young take to the water at once, swimming and diving with great expertness. It is a very shy bird, and difficult to procure; the flight is rapid and well sustained; the habits are gluttonous; the food consists of fish, and its flesh is tough and fishy.—In the genus *lophodytes* (Reich.) the bill is shorter than the head, black, with oblique, low, short serrations, and the point truncated and not recurved nor acute; tail more

than half the wings, tarsi half the middle toe, and head with an erect vertical crest. The only species is the hooded merganser (*L. cucullatus*, Reich.), which is about 18 in. long, with an extent of wings of 26 in., bill 2 in., and a weight of about $1\frac{1}{2}$ lb. In the male, the head,



Hooded Merganser (*Lophodytes cucullatus*)—Male.

neck, and back are black, with the under parts and centre of crest white; sides chestnut brown, barred with black; two black crescents on the white in front of the wing; lesser coverts gray; speculum of wing white, with a basal and median black bar; tertials black, with central white streaks; crest semicircular. In the female, the crest is shorter and more pointed; the head and neck reddish brown; no pure black on the back nor bars on the sides; white on the wings less, and the size much smaller. This, with the exception of the



Hooded Merganser (*Lophodytes cucullatus*)—Female.

European white merganser (*mergellus albellus*, Selby; see SMew), is the handsomest of the family. The habits are those of the other mergansers; it is distributed over the whole of North America. The eggs are like those of the preceding species, except that they are

smaller; the flesh has a fishy taste and odor.—There is a small merganser in South America, for which was established the genus *mergannetta* (Gould), which seems to mark the transition from the ducks to the mergansers. The bill is as long as the head, straight, compressed, elevated at the base; the shoulder of the wing in both sexes is armed with a strong sharp spur; the tail is lengthened and rounded, of rigid and pointed feathers. The only species mentioned by Gray is the *M. armata* (Gould), found inhabiting the rapid rivers of the Andes, swimming and diving against the mountain torrents with the utmost ease; so at home is it on the water, and so rarely disturbed, that it seldom makes use of its wings except for short flights; they are generally seen in pairs.—The affinity of the mergansers with the ducks is further shown by the occurrence of hybrids; in the cabinet of the Boston society of natural history there is a wild hybrid between the *L. cucullatus* and the golden-eyed duck (*Bucephala Americana*).

MERIAN. I. Matthäus, the elder, a Swiss engraver, born in Basel in 1593, died in Frankfurt in 1651. He studied four years in Zürich under Dietrich Meyer, a glass painter and engraver, lived several years in Paris, and afterwards in Frankfurt. He is best known by views representing the environs of Heidelberg, Stuttgart, and other cities, from his own designs (30 vols., Frankfurt, 1640–'88). II. Matthäus, the younger, son of the preceding, born in Basel in 1621, died in Frankfurt in 1687. He studied painting under Vandyke, and attained a considerable reputation, especially for his portraits of the emperor Leopold I. and other German princes, painted after the manner of Vandyke. He also executed a "Martyrdom of St. Lawrence" in the cathedral of Bamberg, and other historical pictures, and was an engraver. III. Maria Sibylla, sister of the preceding, born in Frankfurt, April 12, 1647, died in Amsterdam, Jan. 13, 1717. She drew from nature flowers, caterpillars, butterflies, and similar objects, which she executed in miniature. In 1665 she was married to Johann Andreas Graff, with whom she took up her residence in Nuremberg, retaining her own name. A work on caterpillars, illustrated from her designs, was published in Dutch (2 vols. 4to, Nuremberg, 1679–'83). A Latin translation appeared in Amsterdam in 1717, and in 1730 an enlarged edition was published there in French under the title of *Histoire générale des insectes de l'Europe*. In 1684 she settled with her husband in Holland, and in 1698 sailed for Surinam, where during a residence of two years she prepared the materials for her *Dissertatio de Generatione et Metamorphosis Insectorum Surinamensium* (Amsterdam, 1705), of which a new edition was published soon after her death under the supervision of her daughters. Her two works were republished together in 1768–'71 under the title of *Histoire des insectes de l'Europe et de l'Amérique* (fol.,

Paris). Two volumes of her original drawings are preserved in the British museum.

MÉRIDA (anc. *Augusta Emerita*), a city of Estremadura, Spain, on the right bank of the Guadiana, in the province and 30 m. E. of the city of Badajoz; pop. about 5,000. The streets are paved and clean; the houses are mostly very ancient. The town contains a hospital, a lunatic asylum, a theatre, three churches, two nunneries, and four primary schools. Mérida is famous for its well preserved monuments of Roman antiquity. The Guadiana is here crossed by a bridge built by Trajan, and rebuilt in 1610 by Philip III., with 81 arches, 2,575 ft. long, 26 ft. broad, and 33 ft. above the bed of the river. Another bridge, 450 ft. long, which still retains its original Roman pavement, crosses the little stream Albarregas. There is also a triumphal arch 44 ft. high, built by Trajan; a well preserved amphitheatre; the piers of a stupendous aqueduct; a more modern Roman aqueduct of 140 arches, which still supplies the city with water; a gateway with an Arabic inscription; and a few remains of a castle.—Some historians suppose Mérida to have been founded by the Greeks; but it was certainly rebuilt and called Augusta Emerita by Publius Carisius in 25 B. C. It was taken by the Moors shortly after their landing in Spain in 711, and from them it was wrested by Alfonso the Wise in 1230. Prudentius describes it as a magnificent city in the 4th century; since its annexation by Alfonso it has gradually declined. The French invested the town in June, 1811, but were driven off by the English in April, 1812.

MÉRIDA, an inland city of Mexico, in the peninsula and capital of the state of Yucatan, and of the department of its own name, 22 m. from the gulf of Mexico, and 615 m. E. by N. of Mexico; pop. in 1871, 33,025, chiefly descendants of the Mayas and mestizos. It is situated in the midst of a level plain; the streets are very regular and spacious, and there are several squares. On the principal square stand the cathedral, a majestic structure completed in 1598, the government house, the city hall, the episcopal palace, and the ancient college of San Ildefonso, now occupied by the treasury offices and the state tribunals. Besides the cathedral, there are 14 churches, a hospital with a revenue of \$115,000 and an annual subvention of \$2,400 from the state, a public library, a theatre, prison, house of correction, asylum, several political, mercantile, and literary periodicals, and a number of literary and commercial associations. Education is in a prosperous state, there being schools of law, medicine, and pharmacy, an *instituto literario*, private colleges, academies, and lycées, and 14 primary and grammar schools. Manufactures are very flourishing, including cotton fabrics, cigars and cigarettes, rum, refined sugar, molasses, cordage, leather, soap, Panama hats, &c. The annual value of manufactures is about \$1,200,000. Rope, leather,

and bags are exported to Havana. The port of Mérida is Progreso, on the gulf of Mexico. —Mérida was founded by Francisco de Montejo the younger, on the site of the antique Maya town Te-hoo, in 1542; and it was erected into a bishopric in 1561.

MÉRIDA. I. A S. W. state of Venezuela, bordering upon Zulia (formerly Maracaybo), Trujillo, and Barinas, and the United States of Colombia; area, about 10,000 sq. m.; pop. about 70,000, mostly Indians and mestizos. The surface is extremely uneven, being traversed in all directions by mountains belonging to the Andine chain, comprising 31 peaks exceeding 10,000 ft. in height. The highest summit is in the Sierra Nevada, 15,066 ft. Between the mountain ranges are lofty table lands and extensive valleys. There are 75 rivers, 33 of which flow to the Orinoco through the plains of Barinas; the largest is the Grita, a tributary of the Zulia, navigable for 50 m. from the junction. There are several lakes of considerable size, among them the Lagunilla, 3,000 ft. above the sea, yielding large quantities of *urao* or sesquicarbonate of soda. Nearly all the productions of the torrid and temperate zones abound, and domestic animals are very numerous. II. A city, capital of the state, on a beautiful plateau, 5,421 ft. above the sea, 310 m. S. W. of Carácas; pop. about 6,000. The streets are regular, and the houses generally low and solidly constructed, owing to the frequency of earthquakes. The city has a cathedral, several chapels, a convent, a seminary, a college, and several primary schools. The climate, though subject to frequent and sudden changes, is considered tolerably healthy; the mean annual temperature is 50° F. The chief occupations of the inhabitants are agriculture, cattle rearing, and the manufacture of cotton and woollen fabrics, which are preferred by reason of their cheapness to those from Europe. Woollen carpets, tastefully variegated with brilliant colored flowers from a native vegetable dye, are extensively made. Mérida is the seat of an episcopal see, and was once second in importance among the cities of Venezuela; but it has never fully recovered from the earthquake of 1812.

MERIDEN, a town and city of New Haven co., Connecticut, on the New York, New Haven, and Hartford railroad, 18 m. N. E. of New Haven; pop. in 1850, 3,559; in 1860, 7,426; in 1870, 10,495. The city is handsomely situated and well laid out, and has gas and water works and a paid fire department. There are three post offices, Meriden, South Meriden, and West Meriden. Its manufactories employ a capital of about \$5,650,000, and produce goods to the value of \$7,500,000. The principal productions are iron castings, rolled brass, manufactures of iron, steel, brass, bronze, and tin (including machinery and cutlery), woollens, carriages, cement pipe, and britannia and electro-plated silver ware, the Meriden britannia company being the largest of its kind in the

world. Meriden contains the state reform school for boys, 3 national banks, 2 savings banks, 33 public schools, 3 daily and 4 weekly newspapers, and 12 churches. It was incorporated as a town in 1806, and as a city in 1867.

MERIDIAN. See LONGITUDE.

MÉRIMÉE, Prosper, a French author, born in Paris, Sept. 28, 1803, died in Cannes, Sept. 23, 1870. He studied law, and was received as advocate, but did not practise. In 1830 he became secretary of the count d'Argout, and successively officiated as secretary in the ministry of commerce and chief of bureau in the ministry of marine. In 1834 he succeeded M. Vitet as inspector of ancient historical monuments of France, which furnished him with the materials for several valuable archaeological works. In 1844 he was elected to the French academy, as successor of Charles Nodier. In 1848 two letters published in the *Revue des Deux Mondes* on behalf of his friend Libri, who had been accused of purloining from public libraries, subjected him to an imprisonment of 15 days. In 1853 he was made a senator. He contributed to the romantic literature and drama of France the *Théâtre de Clara Gazul, comédienne espagnole* (1825; new ed., 1865), a professed translation from the Spanish, and *La Guzla* (1827), a professed collection of Illyrian songs. He wrote a series of novels, *La double méprise, Colomba, Carmen, La Jacquerie*, &c., and several historical works. Among the latter are *Chronique du règne de Charles IX.* (1829), *Histoire de Don Pedro I., roi de Castille* (Paris, 1843), and *Épisode de l'histoire de Russie: les faux Démétrius* (1854). His *Mélanges historiques et littéraires* appeared in 1855. His archaeological works are *Peintures de l'église de Saint-Savin* (1845), and researches in Corsica and in the south and west of France. Several of his works have been translated into German and English. A posthumous work, *Lettres à une inconnue* (2 vols., Paris, 1873; English translation edited by R. H. Stoddard, New York, 1874), comprises a series of letters of travel and gossip from 1842 to Sept. 23, 1870, the last having been written two hours before his death. He left numerous manuscripts, including an autobiography, announced in 1874 as in preparation for the press.

MERINO SHEEP. See SHEEP.

MERINTHUS. See CERINTHUS.

MERIONETHSHIRE, a maritime county of North Wales, bordering on Cardigan bay; area, 602 sq. m.; pop. in 1871, 46,598. The surface is almost entirely rocky and mountainous, several of its summits attaining a height of nearly 3,000 ft. above the sea. The most celebrated elevation is Cader Idris, whose summit is crowned with immense columns of crystalline basalt, similar to those forming the Giant's Causeway in Ireland. The principal rivers are the Dee, Maw, and Dovy. The largest lake is Bala, 12 m. in circumference. The principal minerals are copper, limestone, and slate. At the slate quarries of Festiniog several thousand

persons obtain constant employment. Limestone is also quarried. Oats, barley, and potatoes are the chief crops. Capital, Dolgelly.

MERIVALE. **I. John Herman**, an English author, born in Exeter, Aug. 5, 1779, died April 25, 1844. He studied at St. John's college, Cambridge, but took no degree, on account of his being a Presbyterian. He practised in the court of chancery, was commissioner in bankruptcy from 1831, and published several volumes of chancery reports, and a poem, "Orlando in Roncesvalles." A collection of his "Poems, Original and Translated," appeared in 1841.

II. Herman, an English author, son of the preceding, born in Devonshire in 1806, died in London, Feb. 9, 1874. He was called to the bar in 1832, and subsequently appointed professor of political economy in Oxford university. He was made under-secretary of state for the colonies in 1848, and for India in 1859. He has published "Lectures on Colonization and Colonies" (2 vols., 1841-'2; new ed., 1861), "Historical Studies" (1865), and, in conjunction with Sir H. B. Edwardes, a "Life of Sir Henry Lawrence" (London, 1873).

III. Charles, an English author, brother of the preceding, born in 1808. He graduated at Cambridge in 1830, was select preacher before the university in 1838-'40, Hulsean lecturer in 1861, and Boyle lecturer in 1864-'5. In 1848 he became rector of Lawford, Essex, and in 1869 dean of Ely. He has published "Fall of the Roman Republic" (1853); "History of the Romans under the Empire" (7 vols., 1850-'62); "The Conversion of the Roman Empire" and "The Conversion of the Northern Nations" (Boyle lectures for 1864 and 1865); and a "Translation of Homer's Iliad" into English rhymed verse (2 vols. 8vo, 1869).

MERIWETHER, a W. county of Georgia, bounded E. by Flint river, and drained by several creeks; area, 525 sq. m.; pop. in 1870, 13,756, of whom 7,369 were colored. The county is noted for its medicinal springs. The Warm Springs discharge 1,400 gallons a minute at a temperature of 90°. The chief productions in 1870 were 33,098 bushels of wheat, 200,830 of Indian corn, 23,776 of oats, 27,648 of sweet potatoes, 83,480 lbs. of butter, and 8,230 bales of cotton. There were 994 horses, 1,763 mules and asses, 7,058 cattle, 3,220 sheep, and 10,835 swine; 13 flour mills, and 2 lumber mills. Capital, Greenville.

MERLE D'AUBIGNÉ, Jean Henri, a Swiss clergyman and historian, born at Eaux Vives, near Geneva, Aug. 16, 1794, died in Geneva, Oct. 21, 1872. He was descended from a distinguished Huguenot family which was driven out of France by the revocation of the edict of Nantes. He was educated in Geneva, and attended Neander's lectures in Berlin. In 1817 he was ordained, and for six years following was pastor of the French Calvinist church in Hamburg. In 1823 he removed to Brussels, where for seven years he was pastor of a Protestant congregation, and court preacher to the

king of the Netherlands during his stays in that city. After the revolution of 1830 he returned to Geneva and took the chair of ecclesiastical history, and the general direction of a new theological institution founded by the evangelical society of that city. Some years later he began his principal work, *Histoire de la réformation au XVI^e siècle* (5 vols., Paris, 1835-'53). More than 200,000 copies of the English translation of this work have been sold in Great Britain, and at least twice that number in the United States. His supplementary *Histoire de la réformation au temps de Calvin* (5 vols., Paris, 1862-'8) was to have extended to seven volumes, but was not completed at his death. He also published *Le protecteur, ou la république d'Angleterre aux jours de Cromwell* (Paris, 1848); "Germany, England, and Scotland, or Recollections of a Swiss Minister" (London, 1848); *Trois siècles de luttes en Ecosse, ou deux rois et deux royaumes* (1850); and several discourses, and papers in the *Archives du Christianisme*, most of which have been translated into English. In 1870 he published a pamphlet entitled *Le concile et l'infaillibilité*.

MERLIN, a European falcon, of the genus *hypotriorchis* (Boie), which differs from the genus *falco* (Linn.) chiefly in the more lengthened and slender tarsi, and long slender toes. This bird (*H. asalon*, Gmel.) is about a foot long, with an extent of wings of 29 in., the male being a little smaller; it is the smallest of the British falcons, of pleasing colors, compact and graceful in form, with large head and short strong bill, the closed wings about 1½ in. shorter than the tail. In the male, the upper parts are deep grayish blue, each feather with a black



Merlin (*Hypotriorchis asalon*).

central line, the tail barred with black, and the lower parts light reddish yellow with oblong blackish brown spots; in the female, the upper parts are grayish brown with darker shafts, the tail barred with pale reddish, and the lower parts yellowish white with large longitudinal

markings; in both sexes the bill is pale blue at the base, and bluish black toward the end. From its courage and docility it was formerly trained to pursue larks and the smaller game birds. It is found all over Europe and western Asia; it very much resembles the American pigeon hawk (*H. columbarius*, Boie).

MERLIN, the name of two legendary British seers and sorcerers, who lived in the 5th and 6th centuries A. D. **I. Merlu Ambrosius**, a native of Wales, is represented to have been the son of a demon by a Cambrian princess. When a mere youth he recommended himself to the notice of King Vortigern by the display of supernatural powers; and he subsequently became the counsellor of that monarch, and of his successors Ambrosius, Uterpendragon, and Arthur. This is the Merlin to whom allusion is made by Spenser in his "Faerie Queen," and by other old poets. He is also the subject of the metrical romance entitled "Merlin," of which Mr. Ellis has given an analysis in his "Early English Romances;" and he is prominent in Bulwer-Lytton's "King Arthur," and in Tennyson's "Idyls of the King," especially in "Vivien." A book of prophecies attributed to him was printed in French in 1498, in English in 1529, and in Latin in 1554. The principal account of him is given by Geoffrey of Monmouth in his *Historia Britonum*. "The Life of Merlin Ambrosius," by T. Heywood, appeared in London in 1641. The early English text society has reprinted the first part of the prose romance of Merlin from the unique manuscript in the Cambridge university library, edited by H. B. Wheatley (1875). **II. Merlin Caledonius Sylvestris**, or the **Wild**, a native of Strathclyde, in S. W. Scotland, was contemporary with St. Kentigern, bishop of Glasgow, in the latter part of the 6th century. According to Fordun, having slain his nephew, he fled to the woods, and there led the life of a savage till his death. A band of peasants pursuing him, he sprang from a rock into the Tweed, in order to escape them, and was impaled on a stake that chanced to be in the bed of the river. A metrical life of him, incorrectly ascribed to Geoffrey of Monmouth, was printed for the Roxburghe club (London, 1830). The works attributed to him were published at Edinburgh in 1615; but as the rhapsodies and prophecies of the Cambrian and Caledonian Merlins are confounded, being sometimes ascribed to one and sometimes to the other, it is almost impossible to distinguish between them.

MERMAN AND MERMAID, fabulous beings dwelling in the sea, having the head and body of a man or woman, and the tail of a fish. Pliny, Elian, and Pausanias give particular accounts of their being seen by sailors and others, especially in the seas around the island of Taprobane (Ceylon). Julius Cæsar Scaliger, in his commentary on Aristotle (*De Animalibus*), maintains their existence. Rondelet (1554) gave a picture of a singular merman seen in Poland, which was clothed by nature

with the garb of a bishop. The most formidable animal of this kind is the devil-merman, *monstrum marinum dæmoniforme*, captured on the shore of Illyria, seen alive at Antwerp, and described by Aldrovandus. The merrows of Irish legend are mermaids. Capt. Whitbourne minutely describes a mermaid seen by him in 1610 in the harbor of St. John's, Newfoundland. Monsters of similar appearance have since been occasionally described.

MERODACH, or **Bel Merodach**, the second of the minor Babylonian gods, nearly corresponding with the classic Jupiter, and astronomically identified with the planet Jupiter. The name Merodach was at first a mere epithet of the god Bel or Belus, and by degrees superseded the proper name. Its signification or origin is unknown. The golden image in the great temple at Babylon was worshipped as Bel rather than Merodach, but other images probably represented him as Merodach, and the temple itself, described by Herodotus as the temple of Belus, is the temple of Merodach in the inscriptions. In what the distinction between the names consists, however, is not known. Bel Merodach is represented as the son of Ao and Davke, and the husband of Zirbanit. He is the ancient one of the gods, and the judge, and has the gates (probably with the seats of justice near them) under his special charge. He was the tutelary god of Babylon from an early period, and the Babylonian kings were often named after him, as Merodach-baladan and Evil-merodach, such use of the name occurring as early as 1650 B. C. His worship was adopted in Assyria at a later time, probably because of the consolidation of the two monarchies about the time of Pul, who claimed to have first put Merodach at the head of the Assyrian pantheon. Merodach was most honored under the later Babylonian kings, and praises and prayers addressed to him occupy the inscriptions of Nebuchadnezzar. At first he shared with several other deities the worship of the people, but later concentrated in himself the greater part of the homage formerly given to many gods, and was regarded as the source of all power and blessings.

MÉRODE, François Xavier Marie Frédéric Chislain de, a Roman Catholic archbishop, born in Brussels in March, 1820, died in Rome, July 24, 1874. His family claims descent from Raymond Berenger V., count of Barcelona and king of Aragon (died 1162); and one of his cousins was mother to Queen Maria, wife of Amadeus, late king of Spain. His mother was a niece of Lafayette; and his father, Count Félix de Mérode, took a leading part in the Belgian revolution of 1830, was a member of the provisional government, and, after refusing to be the candidate of the Catholic party for the throne, was mainly instrumental in securing the election of Leopold of Saxo-Coburg. Xavier entered the Belgian army in 1841, and served with distinction as a volunteer in Algeria under Marshal Bugeaud. He

went to Rome in 1848, studied theology, and was ordained priest in 1850. He was immediately appointed chamberlain to the pope and canon of St. Peter's, and was rapidly promoted, till in the beginning of 1860 he was made "pro-minister of arms." He organized the pontifical army, composed mostly of foreigners, and induced Gen. Lamoricière to take the command of it in April. That general having been defeated at Castelfidardo in the following September, Mérode asked the French troops in Rome to defend the pontifical authority. He soon quarrelled with the French commander, Gen. Goyon, who refused to communicate with him. In 1865 he resigned his office in consequence of a disagreement with Cardinal Antonelli. He was appointed archbishop of Melitene June 22, 1866, and private almoner to the pope. It is said that the influence of his brother-in-law, Count de Montalembert, caused him in 1869 to oppose the definition of the papal infallibility; but he accepted in 1870 the decision of the Vatican council. He devoted a large portion of his patrimonial wealth to improve the streets and squares of Rome, and to archaeological excavations; but a far larger portion was employed in founding charitable institutions and agricultural and industrial schools. His last public act was to welcome to Rome the American pilgrims from New York.

MEROË, a state, with a capital of the same name, forming part of the ancient kingdom of Ethiopia. It is hardly possible to fix the site of the ancient city, much less to define the boundaries of the state at any given period. The whole of Ethiopia was once called Meroë. Greek writers applied the name to an island and a city on the upper Nile. The district is in reality a peninsula, formed by the Nile and its affluents, the Atbara and Bahr-el-Azrek, between lat. 19° and 18° N., and included in modern times in Nubia. At certain seasons it becomes an island by the overflowing of the rivers. Its length from N. W. to S. E. is about 375 m., and its breadth about 200; and it consists of extensive plains, which formerly were fertile and well cultivated, but are now for the most part desert. This country was very famous in antiquity. It produced gold, iron, copper, and salt; and partly from its natural riches, and partly from its situation between southern Ethiopia and the Red sea, it was from the earliest times the seat of a great commerce, carried on by caravans from all parts of northern Africa, which made its chief city their central rendezvous. According to Herodotus, the "great city called Meroë, which is said to be the capital of the other Ethiopians," was more than 40 days by land and 12 days by boat (52 days in all) beyond Syene. Later writers give it less than half this distance, placing Syene about midway between Alexandria and Meroë. According to Strabo's statement, the city must have been in the neighborhood of the ruins near the modern Begerawieh; but when Meroë

took an active part in history, the residence of King Tahraka (Tirhakah) stood near the modern Meraweh, below Mt. Barkal. The inscriptions give it the name of Neb; the Greeks and Romans called it Napata. During the reigns of the Osortasens and Amenemhes, about 3000 B. C., Egyptian rule extended over Nubia as far as Semneh and Kumeh, under Amenophis III. as far as Soleb, and under Rameses II. to Mt. Barkal. The oldest ruins found here formed part of a temple to Ammon, built by Rameses II.; next in age are the ruins of Tahraka's edifices. These, as well as later monuments, especially the 20 or 30 small pyramids, are imitations of Egyptian art. The monuments of Begerawieh have the same style, though somewhat mixed with foreign elements. It has long been customary to trace the culture of Egypt to that of Ethiopia and Meroë; but Egypt is a well favored land, while Meroë is excessively hot, and fertile only in oases; and the lower valley of the Nile has always been superior in culture and power to the upper; all of which renders it improbable that the civilization of Egypt was in any sense borrowed from Meroë. The reverse is much more probable. There are indications in Herodotus and Diodorus that Meroë had been under the rule of priests, but in the time of Ptolemy II. King Ergamenes established an independent kingdom. The name Meroë is given in the inscriptions of Begerawieh as Meru and Merua, which Lepsius and other Egyptologists translate "white rock." Here, as well as near Mt. Barkal, the shores of the Nile are lined with cliffs of white chalk, which probably gave the name to the country. The Assyrian inscriptions of King Sargon mention the king of Meroë (Milukhi), and one of Sennacherib says that "the king of Egypt had called for the archers, chariots, and horses of the king of Milukhi." The inscriptions of Esarhaddon speak of "the king of Egypt and Milukhi," whom they call also "the king of Egypt and Cush;" and Asshur-bani-pal records his campaign against "Tarkuu (Tahraka) of Egypt and Milukhi." Though the majority of Assyriologists translate Milukhi by Meroë, as George Smith in his "History of Asshur-bani-pal" translated from the Cuneiform Inscriptions" (London, 1871), Lenormant has come to the conclusion that Asshur-bani-pal's Milukhi lay N. of Memphis, and that it was the name of a small independent kingdom which had been established in and near the western portion of the Delta. Ménant, in his *Annales des rois d'Assyrie* (Paris, 1874), has adopted Lenormant's opinion. (See ETHIOPIA.)

MEROPIS. See Cos.

MEROVINGIANS, the name of the first Frankish dynasty in Gaul or France. It was so called from Merovius, king of the Ripuarian Franks (448-558), who aided in the defeat of Attila in 451. He was succeeded by Childeric I. (458-81), whose son Clovis, the conqueror of Gaul, and the first Christian monarch of the

Franks, left his possessions in 511 to his sons Thierry or Theodoric, Clodomir, Chilbert, and Clotaire, the first receiving the east (Austria), the second the southwest (with Orleans), the third the centre (with Paris), and the fourth the north (with Soissons). The line of Thierry became extinct with his grandson Theodebald or Thibault, son of Theodebert. The sons of Clodomir were murdered by their uncles, and Chilbert left no male issue. Thus Clotaire, the youngest son of Clovis, reunited the empire of the Franks (558-'61). On his death it was again divided by his four sons, Charibert reigning in Paris, Gontran or Guntram in Orleans (to which Burgundy, a new conquest, was attached), Sigebert in Austrasia, and Chilperic in Soissons. This period was distracted by internecine wars, during which the two princesses Brunehaut and Fredegonda, the wives of Sigebert and Chilperic, were the most conspicuous characters. Sigebert was assassinated, and his son Chilbert, who also inherited the possessions of Gontran, was succeeded by two sons, Theodebert and Thierry II., who died without legitimate male issue. Clotaire II., the son of Chilperic and Fredegonda, reunited the whole kingdom. It was again temporarily divided by his sons Dagobert and Charibert, the former of whom was the founder of a line of kings known as *fainéants* (lazy), their mayors of the palace being the real rulers of France. They were as follows: Sigebert II., of Austrasia, 638-'56; Clovis II., of Neustria (the western kingdom) and Burgundy, 638-'56; Clotaire III., sole king, 656—of Neustria and Burgundy, 660-'70; Childeric II., of Austrasia, 660-'70—sole king 670-'73; Thierry III., of Neustria and Burgundy (deposed in 670 and restored), 673-'91; Dagobert II., of Austrasia, 674-'9; Clovis III., of Neustria and Burgundy (like all the succeeding), 691-'5; Chilbert III., 695-'71; Dagobert III., 711-'15; Chilperic II., 715-'20; Thierry IV., 720-'37; Childeric III., 742-'52—deposed by Pepin the Short, founder of the Carolingian dynasty.

MERRICK, an E. central county of Nebraska, bounded S. E. by the Platte river, and intersected by Prairie creek and Loup fork; area, about 650 sq. m.; pop. in 1870, 557. The Union Pacific railroad passes along the S. E. border. The soil is fertile, and timber grows along the streams. The chief productions in 1870 were 9,999 bushels of wheat, 13,024 of Indian corn, 31,579 of oats, 3,035 of barley, 5,029 of potatoes, 13,205 lbs. of butter, and 1,548 tons of hay. There were 118 horses, 298 milch cows, 444 other cattle, 478 sheep, and 308 swine. Capital, Lone Tree.

MERRICK, James, an English poet, born in Reading, June 8, 1720, died there, Jan. 5, 1769. He was educated at Trinity college, Oxford, of which he became fellow in 1744. When 14 years old he published "The Messiah, a Divine Essay." He took orders, but from delicate health was unable to perform clerical duties.

Among his works are: a "Translation of Tryphiodorus" (Oxford, 1741); "Poems on Sacred Subjects" (Oxford, 1763); "The Psalms Translated or Paraphrased in English Verse" (Reading, 1766); and "Annotations on the Psalms" (Reading, 1768). His fable, "The Chameleon," is the best known of his works.

MERRIMACK, a river of New England, formed by the junction of the Pemigewasset and Winnepiseogee rivers at Franklin, N. H. From this point the river runs S. 78 m. to Chelmsford, Mass., and thence E. 35 m. to the Atlantic ocean at Newburyport. Its tributaries in New Hampshire are the Contoocook, Soucook, Suncook, Piscataquog, Souhegan, and Nashua; in Massachusetts, the Concord, Spigot, Shawshine, and Powow. The principal tributaries are on the right side of the river. There are numerous falls in the Merrimack, and the river furnishes an immense water power, the employment of which in manufacturing has created the cities of Lowell and Lawrence, Mass., and Nashua and Manchester, N. H. Its width varies from 50 to 150 yards. It is navigable to Haverhill, Mass., 18 m. from the sea. The name is of Indian origin, and is derived from a word signifying a sturgeon.

MERRIMACK, a S. central county of New Hampshire, intersected by the Merrimack river, and its affluents the Contoocook, Soucook, Suncook, &c.; area, about 700 sq. m.; pop. in 1870, 42,151. The surface is broken and in many parts hilly; Mt. Kearsarge is in the N. W. portion. It is traversed by the Concord, the Suncook Valley, the Boston, Concord, and Montreal, the Concord and Claremont, the Contoocook River, and the Northern railroads, and the Bristol branch. The chief productions in 1870 were 31,404 bushels of wheat, 189,788 of Indian corn, 103,525 of oats, 472,131 of potatoes, 144,673 lbs. of wool, 745,386 of butter, 191,298 of cheese, 102,831 of maple sugar, and 78,278 tons of hay. There were on farms 4,887 horses, 10,459 milch cows, 5,619 working oxen, 14,127 other cattle, 34,479 sheep, and 3,991 swine. The number of manufacturing establishments in 1870 was 414; capital invested, \$4,896,995; value of products, \$7,627,676. The most important were 7 cotton mills, 10 woollen mills, 3 paper mills, 36 saw mills, 6 flour mills, 12 tanneries, 11 currying establishments, 3 manufactories of agricultural implements, 3 of leather belting and hose, 2 of boots and shoes, 17 of bricks, 20 of carriages and wagons, 16 of clothing, 6 of furniture, 4 of hosiery, 3 of iron castings, 6 of machinery, 4 of organs, 10 of saddlery and harness, 4 of sash, doors, and blinds, 1 of silverware, and 5 of wooden ware. Capital, Concord, which is also the capital of the state.

MERRITT, Timothy, an American clergyman, born in Barkhamstead, Conn., in October, 1775, died in Lynn, Mass., May 2, 1845. He became a minister of the Methodist Episcopal church in 1796, and spent 34 years as a pastor in Boston, Lynn, Providence, Springfield, New

Bedford, and elsewhere. In 1831 he edited "Zion's Herald" in Boston, and from 1832 to 1837 the "Christian Advocate and Journal" in New York. He also started a monthly periodical in Boston entitled "Guide to Christian Perfection." He was the author of "The Christian's Manual," "The Convert's Guide and Preacher's Assistant," and, with the Rev. Wilbur Fisk, "Lectures and Discourses on Universal Salvation," besides numerous pamphlets and sermons mainly controversial.

MERSEBURG, a town of Prussia, capital of a district in the province of Saxony, on the left bank of the Saale, 15 m. W. of Leipsic; pop. in 1871, 13,364. It is fortified, and was formerly one of the most important towns of Germany. The cathedral, a fine Gothic structure dating from the 13th century, has a richly ornamented portal, and contains some of Albert Dürer's paintings. The town has some manufactories of linen, leather, paper, &c., and extensive breweries and distilleries. Near it Henry the Fowler in 933 achieved a great victory over the Hungarians.

MERSEY, a river of England, formed by the union of several small streams, which have their sources in the hills near the borders of Yorkshire, Cheshire, and Derbyshire. The two principal of these, the Tame and the Goyt, after receiving the waters of all the rest, unite at Stockport. Here the river takes the name of Mersey, and flowing W. divides Cheshire from Lancashire, and falls into the Irish sea below Liverpool. The chief affluents of the Mersey are the Irwell and Weaver. At Runcorn, about 17 m. from its mouth, it expands into a large estuary, which varies in breadth from 2 to 3 m., and contracts at its mouth to about three fourths of a mile. The course of this river is mostly through a level country, but its scenery is occasionally very picturesque. The principal towns on its banks are Stretford, Warrington, Hale, Garston, and Liverpool on the right, and Stockport, Runcorn, Ince, and Birkenhead on the left. Its entire length is from 55 to 60 m., and it is navigable to the Irwell.

MERTHYR TYDFIL (or TYDVIL), a parliamentary borough and market and mining town of Glamorganshire, South Wales, 21 m. N. by W. of Cardiff, with which it is connected by the Cardiff canal and the Taff Vale railway, and 140 m. W. by N. of London; pop. of the borough in 1871, 97,020; of the parish, 51,949. It is in the midst of the great mineral region of South Wales, and has attained its present importance since 1750, previous to which it was a mere village. It is irregularly and poorly built, being largely made up of workmen's houses; but of late years it has been much improved, and in the centre of the new and principal street is one of the largest and finest market places in Wales. It has a large number of places of worship. There are 50 extensive iron works, one of which employs 6,000 men, producing about 260,000 tons of iron yearly.

MERV, a town of Turkistan, in the khanate and 300 m. S. E. of the city of Khiva, and 12 m. E. of the Murghab river; pop. about 3,000. It was one of the four imperial cities of Khorasan, and was the capital of many of the Persian sultans, especially of the Seljuk dynasty. It is on the caravan road from Meshed to Khiva and Bokhara, and though in a very unhealthy country was once a flourishing town, surrounded by beautiful gardens, whose fruits had a high reputation. It was sacked by the Uzbecks about the beginning of the present century, and since then has steadily declined.

MÉRY, Joseph, a French author, born at Les Aigalades, near Marseilles, Jan. 21, 1798, died in Paris, June 17, 1866. He was dismissed from a seminary for reading Voltaire, and from a law school on account of a duel. Subsequently he was wounded in another duel in Paris, and went to Italy, whence he was soon driven by his dissipations. In 1821 he was arrested at Marseilles for writing against the abbé Elicagaray, and rearrested on account of another obnoxious publication. In 1822 he visited Constantinople, quarrelled with the French ambassador, and was obliged to leave. After editing a journal at Marseilles, he established himself in Paris in 1824, and became known in conjunction with Barthélemy (see **BARTHÉLEMY, AUGUSTE MARSEILLE**) by effective satires in verse against various administrations and by his adulation of the Bonaparte family, *Napoléon en Égypte* (1828) being one of their finest lyrics. He acquired still more literary fame by entertaining and eccentric novels and books of travel. Among the best known are *Nuits de Londres* (republished as *Nuits anglaises*), *Héca*, *La Floride*, *La guerre du Nizam*, *Les confessions de Marion Delorme*, *Nuits italiennes*, *Nuits d'Orient*, *Nuits espagnoles*, *Nuits parisiennes*, and *Un carnaval de Paris*. He wrote the libretto for *Sémiramis* and other operas, but was less successful in plays, of which he published a collection entitled *Théâtre de salon* (1861). A new edition of his *Poésies intimes* appeared in 1864. Some of his novels have been translated into English.

MESCALA, a river of Mexico, rises near the city of Puebla, and flows westwardly 400 m. to the Pacific, forming the boundary between the states of Guerrero and Michoacan. In Puebla it is known successively as the Atoyac and the Rio Pablano, further on also as the Rio de las Balsas, and at its mouth it is called the Zacatula. It was long regarded as a probable route of interoceanic communication, but it is not navigable on account of frequent rapids. The waters of the Mescalca are supposed to contain deleterious elements, which have caused a loathsome disease of the skin, prevalent among the Pinto (*i. e.*, spotted) Indians living on its banks. Rich gold placers are found near its mouth.

MESEMBRYANTHEMUM (Gr. *μεσημβρία*, mid-day, and *ἄνθος*, a flower), a genus of succulent

plants called fig marigolds, and by the French *ficoides*, as some species produce an edible fruit resembling a fig. The genus is large, consisting of about 300 species, and the principal one in a small family, the *ficoides* or *mesembryanthemaceæ*. Some of the species are annual, others perennial, with half shrubby, branching stems, and in others the stem is very short, the leaves being collected in a compact rosette like a houseleek. They are natives of warm, dry countries, the greater number being from southern Africa; the leaves in all are exceedingly succulent and well adapted to resist the long droughts of their native regions. Perhaps half of the whole number are in cultivation; the flowers are generally showy, and consist of four or five sepals united by the base and adhering to the ovary, and numerous, very narrow petals, which are often in several series and give the flowers much the appearance of a head of some composite plant; they are white or of different shades of yellow and rose color. The capsule has at the top a series of slits arranged in a star-like manner; these slits remain closed while the capsule is dry, but when the rains have rendered the soil suitable for the germination of the seeds, the slits open by the action of the moisture and allow them to escape. The best known annual species, *M. crystallinum*, is described under ICE PLANT. The perennials are cultivated as greenhouse plants, and are occasionally used for bedding out in summer. The flowers open only on bright days, and usually at noon, but the plants are cultivated quite as much for their striking and odd foliage as for their flowers.



Mesembryanthemum dolabriforme.

The diversity of forms presented by the different species of this genus is remarkable. *M. dolabriforme* is so named from the resemblance of the leaves to the ancient axe or hatchet; in *M. deltoideum* a cross section of

the leaf presents the outline of the Greek Δ ; both of these are tall and branching. *M. tigridium* is one of the low compact species in which the leaves are fringed with strong, spiny teeth, suggestive of a tiger's jaw. The plants are of the easiest cultivation and re-



Mesembryanthemum Leaves.—1. *M. deltoideum*.
2. *M. felinum*.

quire but little water. For so large a genus it contains but few useful species. *M. edule*, the Hottentot's fig, has an edible fruit resembling a small fig, while the leaves of some species and the seeds of others serve as food.

MESHED, or Meshid, a city of Persia, capital of the province of Khorasan, in an extensive valley of the same name, about 185 m. N. W. of Herat, 800 m. E. of the southern extremity of the Caspian sea, and 460 m. E. of Teheran; lat. $36^{\circ} 20' N.$, lon. $59^{\circ} 35' E.$; pop. estimated at 70,000. It is surrounded by walls 12 m. in circuit, enclosing much space occupied only by extensive burying grounds, and great tracts of ruins, the population being mostly confined to the centre. Its principal street is spacious and handsome. The place is chiefly known by the splendid mausoleums of Imam Riza, Haroun al-Raschid, and Nadir Shah. Next to Mecca, it is the most sacred place for a Shiah Mussulman, and many pilgrims visit yearly the shrine of Imam Riza, which is crowned with a splendid cupola and gilded minarets, and stands in a court 480 ft. long and 225 ft. broad. The court is incrustated with mosaic work of painted and glazed tiles, and entered by four lofty gateways. The shrine is entered through a silver gate, the gift of Nadir Shah. Within the same court is the mosque of Gohur Shah, which is also very splendid. Meshed contains several colleges, a spacious but unfinished caravansary, and a palace which is also a citadel. There is an aqueduct whose banks are shaded with trees. Velvets esteemed the best in Persia, sword blades of celebrated temper, some kinds of armor, and some silk and cotton goods are manufactured; and many of the inhabitants are employed in cutting gems from the turquoise mines in the vicinity. There is an important commerce, by the great caravan routes of Persia, with Bokhara, Khiva, Herat, Kerman, Yezd, and other quarters; rich caravans arrive daily. Near by are the ruins of Thus, the home of the poet Firdusi. The town suffered terribly from the famine of 1871.

MESILLA, a town of Doña Aña co., New Mexico, on the right bank of the Rio Grande, about 240 m. S. by W. of Santa Fé; pop. in 1870, 1,578. The town, which lies in a valley of the same name, obtained notoriety from a dispute between the United States and Mexico in the settlement of the boundary under the treaty of Guadalupe Hidalgo, made in 1848. It was subsequently included in the purchase by the United States under the "Gadsden treaty" of 1853. Mesilla is the diminutive of the Spanish *mesa*, table; as here applied, it means a small plateau, or table land, on the bottom land of the Rio Grande, to distinguish it from the great table land, which is more elevated, and which extends for many hundred miles on both sides of the river. The Mesilla valley is about 30 m. long and from 1 to 4 m. wide. The soil is a rich alluvium, but artificial irrigation is required.

MESMER, Friedrich Anton, a German physician, the first promoter of animal magnetism, or "mesmerism," born at or near Meersburg, Baden, on the lake of Constance, in 1733 or 1734, died there, March 5, 1815. He studied medicine in Vienna, and took his degree of M. D. there in 1766, presenting on that occasion a thesis *De Planetarum Influæ in Corpus Humanum*, in which he held that the universe is pervaded by a subtle element exercising an extraordinary influence on the human body, and identical with the magnetic element. The means by which he brought his theory into notice, and the leading features of his life, are given under the head of **ANIMAL MAGNETISM**.

MESOLONGHI. See **MISSOLONGHI**.

MESOPOTAMIA (Gr. *μῆσος* and *ποταμός*, between the rivers, viz., Euphrates and Tigris; Heb. *Aram Naharaim*, Aram or Syria between the two rivers; now *Al-Jezireh*, the island), an ancient country of western Asia, bounded, according to the common acceptance of the name, N. by Armenia, from which it was separated by the Masius range, a branch of the Taurus; N. E. and E. by the Tigris, separating it from Assyria; S. by Babylonia; and S. W. and W. by the Euphrates, separating it from Syria. The Greek name seems to have been first used in the time of the Seleucidæ. Mesopotamia has never been a political designation, but always a purely geographical one; and it is sometimes found applied also to the regions bordering on the valley of the two rivers. Excepting the Masius range and its prolongation parallel to the upper Tigris, Mesopotamia formed a vast and mostly very fertile plain, well watered by rivers and canals, the chief stream between the two great rivers being the Chaboras, an affluent of the Euphrates, and the principal productions of the country grain, fruits, spices, timber, cattle, naphtha, and jet. The southernmost part of the plain, however, resembled the adjoining regions of the Syro-Arabian desert, and was inhabited by numerous wild animals, including lions, ostriches, and wild asses. Among the cities of Mesopotamia were:

Apamea on the Euphrates, opposite Zeugma in Syria; Edessa (now Urfa), the capital of the province of Osroëne; Carræ or Carrhæ, the Haran of Abraham; Ciresium, the Scriptural Carchemish, near the mouth of the Chaboras; and Nisibis (Nizib), the Scriptural Zoba, in the province of Mygdonia. Mesopotamia was inhabited by a people called Rotennu or Retennu on the Egyptian monuments. They were of Semitic race, and were struggling with Egypt for supremacy as early as 1600 B. C. In later times it was in turns a part of the Assyrian, Babylonian, Persian, Macedonian, Syrian, Parthian, and Neo-Persian monarchies, until it was conquered by the Arabs. It was subsequently invaded by the Seljuks, conquered in part by the crusaders, and finally became a province of the Ottoman empire.

MESSALA, or **Messalla** (**MARCUS VALERIUS MESSALA CORVINUS**), a Roman general, born according to Eusebius in 59, but according to Scaliger about 70 B. C., died about the beginning of the Christian era. He completed his studies at Athens, and on the outbreak of the second civil war joined Brutus and Cassius in the East, was appointed to the third rank in the republican army, and commanded under Cassius at Philippi (42). After the overthrow of his party he surrendered to Antony, to whom he attached himself until, perceiving the ruin of that triumvir inevitable, he withdrew from his service, and entered that of his rival, for whom he fought in Sicily, against the Salassi in the Alps, and at Actium (31). He was appointed to succeed Antony as consul, and subsequently he obtained the proconsulship of Aquitania, for the reduction of which province a triumph was decreed him. He was selected by the senate to greet Octavius with the title of *pater patriæ*, and the exordium of his oration has been preserved by Suetonius. Soon after this Messala resigned all his official dignities except the aurgurship, and retired to private life. Fragments of his orations remain (Paris, 1842); his other writings are only known by their titles.

MESSALINA, or **Messallina**, the name of two Roman empresses, who lived in the 1st century of the Christian era. **I. Valeria**, daughter of M. Valerius Messala Barbatus, and third wife of Claudius, to whom she was married before his accession to the empire. She was equally profligate and cruel. Many members of the most illustrious families of Rome were sacrificed to her fears, her jealousy, or her hatred. Among her noblest victims were the two Julias, one the daughter of Germanicus, the other of Drusus, son of Tiberius, who had excited her jealousy or envy; C. Appius Silanus, who had wounded her vanity by rejecting her advances; and Justus Catonius, whose offence was privy to her guilt. For a long time Claudius was blind to her infidelity; but when, during his absence at Ostia, she contracted a public marriage with Caius Silius, a handsome youth for whom she had conceived a violent passion, he

caused her to be put to death. The sentence was executed in A. D. 48, by a prætorian tribune, in the gardens of Lucullus. By Claudius she was the mother of two children, Britannicus and Octavia. **II. Statilia**, the third wife of the emperor Nero, whom she survived, and the granddaughter of T. Statilius Taurus, who had been consul in A. D. 11. She was first married to Atticus Vestinus, but the tyrant caused her husband to be put to death, and espoused her in 66.

MESSANA. See **MESSINA**.

MESSAPIA, the ancient Greek name of the peninsula forming the S. E. extremity of Italy, called by the Romans Calabria, a name applied in modern times to the opposite peninsula. (See **CALABRIA**.) The boundary separating it from Apulia on the N. W. was not well defined, but Messapia consisted of what is popularly called the "heel of the boot." The peninsula was probably first known to the Greeks by the name of Japygia, which was afterward applied by them to all S. E. Italy, Herodotus speaking of Apulia as a part of Japygia, while Messapia indicated the peninsula only. Later writers make Japygia and Messapia synonymous, and confine them to the peninsula. The inhabitants were of two tribes, the Salentini along the S. W. coast near Tarentum, and the Calabri, whom the Greeks called Messapians, along the N. E. part. The latter were the more powerful, and the whole district came to be called after them by their Greek and Latin names respectively. It terminated at the S. E. in the rocky Japygian promontory (now Cape Leuca), standing boldly out into the sea. It was celebrated for its fertility, abounding in wine, olives, and other fruits. (See **OTRANTO**, **TERRA D'**.) The Calabrian horses were famous, and the Tarentine cavalry was long celebrated. Virgil says that the region was infested by peculiarly venomous serpents. The inhabitants were of Pelasgic origin, had attained a considerable culture, and possessed the cities of Hyria or Uria and Brundisium in the latter part of the 8th century B. C., when the Greek colony of Tarentum was founded. They fought against the Greek colonists for many years, defeating the Tarentines in a great battle about 478, but were gradually overcome by the Greek civilization and corrupted by its luxury. They made a short resistance to the Romans, uniting with neighboring tribes under the command of Pyrrhus, but were overcome in a single campaign after his fall. They revolted to Hannibal in the second Punic war, but were soon subdued. Under the empire Messapia was united for administrative purposes with the province of Apulia. The Byzantine emperors retained a footing here during the invasion by the Goths and Lombards, and were not finally expelled till the 11th century.

MESSENE, the capital of Messenia in the Peloponnesus, founded by Epaminondas after his victory of Leuctra over the Lacedæmonians, 371 B. C. It was at the foot of the hill of

Ithome, the fortress of which formed the acropolis of the new capital, and was surrounded by massive stone walls, flanked with towers, of which there are still considerable remains at the modern village of Mavromati. Messene with its acropolis was, next to Corinth, the strongest city of the Peloponnesus. It was supplied with water from a fountain called Clepsydra, the spring of which still exists.

MESSENEIA, or **Messene**, the S. W. division of the Peloponnesus in ancient Greece, bounded N. by Elis, from which it was separated by the river Neda, and Arcadia; E. by Laconia, the boundary line varying at various periods; and S. and W. by the sea, which on the south forms the large gulf of Messenia, or, as it is now sometimes called, of Coron. It is a mountainous country, containing but two plains of any extent, the southern of which, traversed by the Pamisus, was called Macaria or the Blessed, on account of its great fertility. The valleys among the mountains were also fertile, and the whole country was renowned for the mildness of its climate. Among the few towns of note were Pylos, a seaport, Cyparissia, Corone (now Coron), Methone (Modon), Abia, Dera, Stenyclarus in the northern plain of the same name, and the later capital Messene, besides the mountain fortresses of Ithome and Ira. The earliest inhabitants of Messenia were Leleges and Argives. Polycaon, son of Lelex, is said to have given the country its name from Messene, his wife, daughter of the Argive Triopas. It was subsequently settled by Æolians. During the following period Messenia seems to have belonged partly to Pylos and partly to Lacedæmon. When the Dorians conquered the Peloponnesus, it became the possession of Cresphontes, who destroyed the kingdom of Pylos. Of the kindred Dorian states, Sparta, the eastern neighbor, soon developed its aggressive policy, and after various collisions and mutual inroads the first Messenian war broke out. It is said to have lasted 20 years, its principal Messenian hero and victim being Aristodemus, and ended with the fall of Ithome and the subjugation of Messenia. After 38 years of subjection, the Messenians rose under the lead of Aristomenes, supported by Argos, Arcadia, and other states of the Peloponnesus, while their enemies received the support of Corinth. Aristomenes succumbed after a struggle of 17 years, and Ira fell. (See **ARISTOMENES**, and **TYRTÆUS**.) In common chronology the first war is placed at 743-723 B. C., and the second at 685-668. The two great struggles are considered as sufficiently attested, but the particulars, which are highly poetical and rest on authorities of the 3d century B. C., are justly doubted. The consequence of the wars was the emigration of a large number of the inhabitants to Italy and Sicily, giving the name of Messene or Messana to the town of Zancle in that island, and the subjection of those who remained to the condition of helots. Together with the other slaves of Sparta, they

were induced by the great earthquake which devastated the capital of their oppressors in 464 to strike once more for freedom. This third Messenian war lasted ten years, and was terminated by the capitulation of the defenders of Ithome, who were allowed a free departure from the Peloponnese. They settled at Naupactus, on the northern shore of the Corinthian gulf, a town recently conquered by Athens, now the declared rival of Sparta. When the former was crushed by the fatal issue of the Peloponnesian war, the Messenians of Naupactus were compelled to leave Greece. Epaminondas finally restored the independence of Messenia, convoking the refugees from the various lands of their exile, after the great battle of Leuctra (371), and giving the country a strongly fortified capital in Messene, a new town at the foot of the old stronghold Ithome (369), which was maintained down to the time of the Roman conquest of Greece in 146.—The modern nomarchy of Messenia is bounded N. by Achaia and Elis, E. by Arcadia, S. by the gulf of Messenia or Coron, and W. by the Ionian sea; area, 1,226 sq. m.; pop. in 1871, 130,417. Capital, Kalamata.

MESSER, Asa, an American clergyman, born in Methuen, Mass., in 1769, died in Providence, R. I., Oct. 11, 1836. He graduated in 1790 at Brown university, where he became in 1796 professor of languages, in 1799 professor of

mathematics and natural philosophy, and from 1802 to 1827 he was president of the university. He was licensed to preach by the first Baptist church in Providence in 1792, and ordained in 1801. The citizens of Providence for several years elected him to important civil offices. Three of his discourses and five orations have been published.

MESSIAH. See JESUS CHRIST.

MESSINA. I. A province of Sicily, including the N. E. extremity of the island, bordering on the Mediterranean and the strait of Messina, which separates it from Calabria; area, 1,768 sq. m.; pop. in 1872, 420,649. It is traversed from E. to W. by the Neptunian mountain range, and by the Monforte, San Antonio, and several other small streams. The mountains abound with wood. There are no large plains, but many valleys, which as well as the banks of the rivers are very fertile in wine, oil, nuts, and fruit of every sort, particularly lemons and oranges. The other principal products are silk, hemp, and flax. Some cotton of an inferior quality is raised for home consumption. The most important mineral product is sulphur. On the south a portion of the province skirts the base of Mt. Etna. It is divided into four districts and includes the Lipari islands. Among the chief towns, besides Messina, are Castro Reale, Milazzo, Patti, Randazzo, and Taormina. II. A city (anc. *Messana*), capital of



Messina.

the province, on the N. E. corner of the island, on the strait of Faro or Messina, here about 4 m. wide, 120 m. E. by N. of Palermo, and 45 m. N. E. of Mt. Etna; pop. in 1872, 111,854. The approach from the sea is of remarkable beauty, the city rising in the form of an amphitheatre, and the dazzling whiteness of the houses pre-

senting a picturesque contrast to the dark mountains in the background. The principal part of the city is built on the W. side of the harbor, paved with square blocks of lava, and contains several wide and handsome streets ornamented with statues and fountains. It contains more than 50 churches, the most an-

cient of which is the cathedral, and has also an arsenal, naval arsenal, archbishop's palace, senate house, custom house, a large hospital, two theatres, a lazaretto, and numerous convents and nunneries. Messina is the seat of an archbishop. The harbor, one of the finest in the world, is about 4 m. in circuit, and can accommodate the largest fleet. The imports are colonial produce, cotton and woollen fabrics, hides and hardware. The total exports for 1870 amounted to \$8,636,500, of which lemons and oranges were valued at \$2,904,225; olive oil, \$2,306,855; essence of orange, lemon, and bergamot, \$1,358,070; and raw silk, \$476,780. Tartar, limestone, almonds, and filberts are exported in considerable quantities. The total imports in 1870 amounted to \$5,853,755. In the same year there were entered 1,284 steamers, of 763,022 tons, and 3,259 sailing vessels, of 360,214 tons; and cleared 1,274 steamers, of 745,900 tons, and 2,992 sailing vessels, of 324,421 tons. The principal manufactures are damasks and satins. Coral, tunny, and other fisheries are extensively carried on. Messina is defended by walls and bastions, a citadel, and many forts, and is considered a fortress of the highest importance, as commanding the strait of its name, and thus being the principal gate to Sicily from the mainland. A railway extends to Catania, 59½ m., and another to Palermo is now (1875) in progress.—The origin and early history of the ancient city are involved in obscurity. It is believed to have been founded by colonists from Magna Græcia and Greece between 1000 and 800 B. C., to have made rapid strides in prosperity, and to have derived its name from a body of emigrants from Messene in Greece, the original name having been, according to Thucydides, Zancle, after the similar Greek word signifying a sickle (the form of the harbor). In 396, when it was celebrated for its flourishing trade, a Carthaginian army landed in Sicily and destroyed the city, which was immediately rebuilt by Dionysius of Syracuse, who expelled the invaders. About 280 it was seized by the mercenaries expelled from Syracuse on the death of Agathocles, who were called Mamertini, children of Mamers or Mars, and who subsequently applied for assistance to the Romans; hence arose the first Punic war, in the course of which the city was taken by its allies, and thus became the earliest dependency of Rome beyond the Italian continent. Cicero calls it a very great and very rich city. In the civil war of 49–48 it was the station of a part of the fleet of Cæsar, and Sextus Pompey after his defeat by the fleet of Octavius under Agrippa (36) made his escape from it with only 17 ships. During the middle ages Messina continued to be an important city. To avenge the massacres of Sicily, it was besieged in 1282 by Charles of Anjou, king of Naples, but relieved by Pedro of Aragon and Roger de Loria. In 1673 it submitted to Louis XIV., but he was compelled to withdraw his forces by

the Dutch and Spanish fleet. In 1743 it was afflicted by the plague, and the great earthquake of 1783 destroyed and depopulated almost the whole city, and it has since been rebuilt upon a better plan. It suffered severely from an inundation in 1823. A revolutionary outbreak took place there in 1848, but the insurgents were put down by the Neapolitans (Sept. 7). The possession of Messina during the war of that year enabled the king of Naples to reconquer the island. Every attempt at a popular movement was punished with the utmost rigor, a strong garrison was continually kept there, and the fortifications of the place were strengthened. In 1860, however, after the victory at Milazzo (July 20), Garibaldi's army entered the town, and an agreement was soon after entered into by which the citadel and three forts were to remain in the hands of the latter, and the town and two forts in the possession of the Sicilians. The citadel was invested by Gen. Cialdini on March 7, and surrendered on March 13, 1861. The recent erection of a lighthouse, a mosque, and an agency for the *messageries maritimes*, and the repair of the streets, have absorbed every vestige of ancient Messina except a colonnade whose stones could not be made available.

MESTIZO, a Spanish-American term for the mixed offspring of Europeans and Indians. In Mexico, Peru, and Brazil, mestizos are very numerous. Their color is almost a pure white, with a skin of remarkable transparency. The chief indications of the mixture of Indian blood are a thin beard, small hands and feet, and an obliquity of the eyes. The women of this race are called *mestizas*, and the offspring of their marriage with whites differ but slightly from pure Europeans.

MÉSZÁROS, Lázár, a Hungarian general, born in Baja, county of Bács, Feb. 20, 1796, died at Eywood, Herefordshire, England, Nov. 16, 1858. He studied law at Pesth, but in 1813, on the outbreak of the new war against Napoleon, he entered the Hungarian army in the service of the emperor Francis. He was in Italy as colonel of a hussar regiment in the spring of 1848, when he received the first information of the important changes in Hungary, and was soon after offered the ministry of war in the cabinet of Batthyányi, and started for Pesth. Elected a member of the diet, he defended the moderate measures of the ministry. He went to the seat of war in the south, but failed in his attempts to storm the Rascian ramparts of Szent-Tamás (September). When Austria avowed the purpose of subjugating Hungary, he took the revolutionary side. In December he was sent to the north to check the advance of Schlick; but after an indecisive encounter at Szikszó (Dec. 28), his motley army suffered a total rout before Kaschau (Jan. 4, 1849). When the difficulties with Görgey compelled Kossuth to appoint a new commander-in-chief, the title was given to Mészáros and the real command to Dembinski, with whom

Mészáros soon after shared in the defeats at Szőreg (Aug. 5) and Temesvár (Aug. 9), and a few days later was an exile in Turkey. Accompanying Kossuth to Widin, Shumla, and Kutaieh, he was allowed in May, 1851, to depart for England. He lived for some time in France, went to the island of Jersey after the *coup d'état* of Dec. 2, 1851, and in the summer of 1853 sailed to America, where he resided at Flushing, L. I., and was naturalized as an American citizen. At his death he was on his way to visit Switzerland.

METAL (Gr. *μέταλλον*), a term including about 50 elementary substances which possess, either wholly or in part, certain well marked physical and chemical properties, of which the most universal and characteristic is lustre. The peculiar brilliancy and reflective power of the metals, which may be enhanced by polishing, results from their great opacity. The color of the metals is generally white with a grayish, bluish, or pinkish tint; copper and gold are the only exceptions. In extremely thin films some of the metals allow the passage of certain rays of light. Gold leaf transmits light of a faint greenish hue. Most of the metals have a high specific gravity, a property which was regarded as characteristic until the discovery of the alkaline metals, which are lighter than water. With the exception of arsenic, they may all be fused, the temperature required for fusion varying from 100° F. to the highest heat of the oxy-hydrogen blowpipe. Some of the metals may be volatilized. Mercury, the only liquid metal, is solidified at -39° F. Arsenic when heated passes directly into vapor without fusion. Most of the metals possess a certain mobility of particles that allows of their being extended or otherwise altered in form. The two nearly related properties of malleability and ductility, resulting from this, are not possessed by the metals in the same degree. A few of them, as antimony, arsenic, and bismuth, are decidedly brittle. Some assume a plastic condition before complete fusion, notably iron and platinum; on this property depends the operation of welding. The strength of the metals is very dissimilar, iron in the form of wire being about 26 times as tenacious as lead. They are all conductors of heat and electricity, although differing widely in this respect. The metals at present known, with the name of the discoverer and date of discovery of each, together with their atomic weights, are given in the following table:

METAL.	Atomic weight.	Discoverer.	Date of discovery.
Gold.....	197	Known to the ancients.	.....
Silver.....	103	" " "	.....
Mercury.....	200	" " "	.....
Copper.....	63.4	" " "	.....
Lead.....	207	" " "	.....
Tin.....	118	" " "	.....
Iron.....	56	" " "	.....
Bismuth.....	210	Basilus Valentinus.	15th century.
Antimony.....	122	" " "	"

METAL.	Atomic weight.	Discoverer.	Date of discovery.
Zinc.....	65	First mentioned by Paracelsus.....	16th century.
Arsenic.....	75	Schröder.....	1604
Cobalt.....	59	Brandt.....	1733
Platinum.....	197.4	Ulloa.....	1786
Nickel.....	59	Cronstedt.....	1751
Manganese.....	55	Gahn.....	1774
Molybdenum.....	96	Hjelrn.....	1782
Tungsten (wolfram).....	184	D'Elhujar.....	1783
Titanium.....	50	Gregor.....	1789
Yttrium.....	61.6	Gadolin.....	1794
Chromium.....	52.2	Vanquelin.....	1797
Tellurium.....	128	Klaproth.....	1798
Niobium (columbium).....	94	Hatchett.....	1801
Tantalum.....	182	Ekeberg.....	1802
Palladium.....	106.6	Wollaston.....	1808
Osmium.....	199	Tennant.....	1808
Cerium.....	92	Klaproth, Hisinger, and Berzelius.....	1808
Iridium.....	198	Descottis and Tennant.....	1808-4
Rhodium.....	104.4	Wollaston.....	1804
Potassium.....	39.1	Davy.....	1807
Sodium.....	23	".....	1807
Barium.....	137	".....	1808
Strontium.....	87.6	".....	1808
Calcium.....	40	".....	1808
Lithium.....	7	".....	1818
Cadmium.....	112	Stromeyer.....	1818
Zirconium (beryllium).....	89.6	Berzelius.....	1824
Aluminum.....	27.4	Wöhler.....	1827
Glucinum.....	9.4	Wöhler and Bussy.....	1828
Thorium.....	115.7	Berzelius.....	1828
Magnesium.....	24	Davy.....	1828
Vanadium.....	51.3	Sefstrom.....	1830
Lanthanum.....	93.6	Mosander.....	1839
Uranium.....	120	Pellogot.....	1840
Didymium.....	95	Mosander.....	1841
Erbium.....	112.6	".....	1848
Ruthenium.....	104	Claus.....	1846
Rubidium.....	85.4	Bunsen and Kirchhoff.....	1860
Cesium.....	133	" ".....	1860
Thallium.....	204	Crookes (Lamy).....	1861
Indium.....	118.4	Reich and Richter.....	1863

With a few exceptions, the names and dates in the above list refer to the actual production of the metal. In many instances the metallic compounds were known and studied long before the metal itself was isolated. Some of the rarer metals have never been prepared in a pure form. Pelopium, formerly enumerated among the metals, has been shown to have no existence; and the existence of terbium is doubtful. The last four metals were discovered by means of the spectroscope.—The following tables exhibit the mutual relations of some of the more important metals in physical properties:

SPECIFIC GRAVITIES.		TEMPERATURE OF FUSION.	
Lithium.....	0.593	Mercury.....	-39.44° C.
Potassium.....	0.865	Potassium.....	+ 62.50
Sodium.....	0.972	Sodium.....	95.60
Magnesium.....	1.750	Tin.....	222
Antimony.....	6.71	Lead.....	325
Chromium (cast).....	6.81	Zinc.....	412
Zinc.....	7.15	Antimony.....	450
Tin.....	7.29	Silver.....	1000
Iron (pure).....	8.12	Copper.....	1200
Nickel (forged).....	8.67	Gold.....	1200
Copper (cast).....	8.92	Wrought iron.....	1800
Silver.....	10.50	Platinum, fusible only by oxy-hydrogen blow-pipe.	
Lead.....	11.35		
Mercury.....	13.59		
Gold.....	19.30		
Platinum (fused).....	21.15		

ORDER OF TENACITY.	ORDER OF MALLEABILITY.	ORDER OF DUCTILITY.
Lead..... =1	Gold.	Gold.
Tin..... 1·3	Silver.	Silver.
Gold..... 5·6	Copper.	Platinum.
Zinc..... 8	Platinum.	Iron.
Silver..... 8·9	Iron.	Copper.
Platinum..... 13	Tin.	Zinc.
Copper..... 17	Zinc.	Tin.
Iron..... 26	Lead.	Lead.

CONDUCTIVITY FOR HEAT.	CONDUCTIVITY FOR ELECTRICITY.	LINEAR EXPANSION BY HEAT BETWEEN 0° AND 1000° C.
(Frans and Wiedemann.)	(Matthiessen.)	
Silver..... =1000	Silver..... =1000	Lead..... 0·00301
Copper..... 736	Copper..... 774	Tin..... 0·00273
Gold..... 532	Gold..... 532	Zinc..... 0·00220
Zinc..... 190	Zinc..... 274	(forged).
Tin..... 145	Iron..... 144	Silver..... 0·00199
Iron..... 119	Tin..... 115	Gold..... 0·00133
Lead..... 85	Lead..... 78	W'r't iron 0·00119
Platinum..... 84	Mercury..... 16·3	Platinum.. 0·00063

THERMO-ELECTRIC ORDER.	SPECIFIC HEAT.
	(Water = 1.)
Antimony.	Lithium..... 0·9403
Arsenic.	Sodium..... 0·2334
Iron.	Aluminum..... 0·2143
Zinc.	Iron..... 0·1183
Gold.	Copper..... 0·0952
Copper.	Zinc..... 0·0956
Lead.	Silver..... 0·0570
Tin.	Tin..... 0·0562
Silver.	Antimony..... 0·0503
Cobalt.	Gold..... 0·0324
Palladium.	Platinum..... 0·0324
Platinum.	Mercury..... 0·0333
Nickel.	Lead..... 0·0314
Mercury.	Bismuth..... 0·0303
Bismuth.	

The physical properties of the metals are largely dependent on their purity and molecular condition, and on temperature. Hammered, rolled, or drawn metal generally has a higher specific gravity than cast metal. The state of molecular tension often induced by mechanical working, especially when cold, is resolved by annealing, *i. e.*, heating and slow cooling. Most of the metals are more malleable and ductile at high temperatures. Commercial zinc is only malleable between 100° and 150° C.; at 200° it is so brittle that it can be pulverized. The conductivity for electricity is greatly diminished at high temperatures, and also by the presence of impurities in the metal. The addition of a small amount of a foreign substance often makes a metal harder, more rigid, and less susceptible of elongation. This is notably the case with iron, which when pure is soft and stretches considerably under strain before breaking, while steel, which is iron with a small amount of carbon, may be rigid and brittle. If reference be had to the original area of section, the rigid metal will show the greatest strength under a gradually applied tensile strain; but if to the fractured area, the purer metal is the strongest. The tenacity of metals generally decreases as the temperature is raised. The fusing points of the more refractory metals given in the above tables are

approximate only, since trustworthy methods for determining high temperatures are wanting. The metals vary greatly in hardness. The alkaline metals are as soft as wax, while some, as chromium, will scratch glass. It is not improbable that extreme hardness in metals is produced by the presence of some foreign body, and is not inherent in the metal itself. Most of the metals are capable of assuming a distinctly crystalline form, generally belonging to the regular or isometric system. Some, as antimony and arsenic, crystallize in rhombohedrons. A few of the metals occur native; these are gold, platinum, palladium, iridium, and rhodium, which are almost exclusively found in the metallic state, and silver, copper, mercury, bismuth, arsenic, and antimony. Generally, however, the metals occur mineralized in combination with oxygen or sulphur. The specific heats of the metals, as will be noticed in the above tables, are inversely as their atomic weights, or, in other words, the specific heats of the atoms of the metals are equal.—Chemically, the metals present very varied characters. As a class they are distinguished by the formation of compounds with oxygen which have basic characters, while the non-metals as a class form oxides which have acid characters. These two classes of oxides are capable of combining to form salts. While the oxides of the non-metals never form bases, the higher oxides of many of the metals have distinctly acid properties, and indeed a few of the metals form only acid oxides. The most stable compounds of tellurium, arsenic, antimony, tungsten, titanium, molybdenum, and vanadium with oxygen are acid in character and capable of combining with basic oxides. Those metals which seem to hold a position intermediate between the two classes have been termed half metals or metalloids. The latter term, as now generally used, includes all the non-metallic elements, *viz.*: hydrogen, oxygen, bromine, chlorine, iodine, fluorine, boron, nitrogen, phosphorus, selenium, silicon, sulphur, and carbon. Tellurium is closely related to sulphur and selenium, and is often classed with the metalloids; but its metallic appearance, and the analogy which its compounds bear to those of antimony, render its association with the metals equally appropriate. Hydrogen, although a gas and the lightest body known, resembles the metals in its chemical properties, and is capable of replacing them in combination. The formation of salts is regarded in modern chemistry as the replacement of hydrogen in the acid by a metal.—The metals are variously classified. A natural grouping, and one in common use, is: 1, metals of the alkalis; 2, metals of the alkaline earths; 3, metals of the earths proper; 4, oxidable metals proper, whose oxides form powerful bases; 5, oxidable metals, whose oxides form weak bases or acids; 6, metals proper, whose oxides are reduced by heat, called noble metals. The strength of affinity of the different metals

for oxygen is the basis of a classification formerly much used. It is embodied in part in the electro-chemical series of Berzelius, which played an important part in the development of chemical science. The alkaline metals oxidize rapidly in the air, and decompose water at ordinary temperatures; others, as iron and zinc, do not oxidize in pure dry air, and decompose water only at a red heat, or in contact with an acid; and others, as the noble metals, do not decompose water at any temperature. The electrical relations of the metals correspond in general to their affinity for oxygen. Thus, the alkaline metals are the most electro-positive, and the noble metals the most electro-negative. The metals likewise fall into groups in which the individual members can replace one another in compounds without change of crystalline form; they are then said to be isomorphous. As examples may be cited magnesium, calcium, manganese, iron, zinc, copper, and aluminum; barium, strontium, and lead; sodium, silver, thallium, gold, and potassium; arsenic, antimony, and bismuth; tin, titanium, tungsten, and molybdenum; platinum, iridium, and osmium. The atomicity of the elements, or their combining values, forms the basis of classification for study in modern chemistry. Metals are thus divided into monads (or those replaceable by or equivalent to one atom of a monogenic element, as hydrogen or chlorine), dyads, triads, tetrads, pentads, and hexads, as follows: monads—lithium, sodium, potassium, rubidium, calcium, silver; dyads—calcium, strontium, barium, glucinum, yttrium, lanthanum, didymium, erbium, thorium, magnesium, zinc, cadmium, copper, mercury; triads—gold, thallium; tetrads—titanium, tin, aluminum, zirconium, rhodium, ruthenium, palladium, platinum, iridium, osmium, lead, manganese, iron, cobalt, nickel, cerium, indium, uranium; pentads—vanadium, arsenic, antimony, bismuth, niobium, tantalum; hexads—chromium, molybdenum, tungsten. A few of the metals possess more than one atomicity, and appear in different compounds with different atomic values. The combinations of the metals with the non-metallic elements may be divided into two classes, those with chlorine, iodine, bromine, and fluorine, and those with oxygen, sulphur, selenium, and tellurium. The former class are saline compounds, while the latter are generally basic, exceptionally acid, as before mentioned. Formerly the distinction was generally observed between haloid and oxygen salts, the former being the combination of a metal with a haloid body, as chloride of sodium, and the latter a combination of a basic oxide with an oxy-acid, as sulphate of soda. In the modern chemistry both characters of salts are regarded as the replacements of hydrogen in the acid by a metal. The combinations of the metals among themselves are known as alloys, or, in case of mercury, as amalgams. (See ALLOY, and AMALGAM.)

METALLOIDS. See METALS.

METALLURGY (Gr. *μεταλλουργός*, working metals), the science which treats primarily of the separation and isolation of the metals contained in their natural combinations or associations, known as ores, and secondarily of the manipulation of the metals and the production of metallic compounds or alloys. The modes of occurrence of metals in nature are: 1, native, either pure or alloyed; 2, sulphides and combinations of sulphides and arsenides; 3, oxides and combinations of oxides with silicic and carbonic acids. More rarely arsenides, chlorides, tellurides, &c., are met with, and also compounds of oxides with other acids than those mentioned, as phosphoric, sulphuric, &c. The metallurgical treatment of an ore depends first on the physical characters of the minerals and accompanying rocks, and secondly on their chemical composition. It may therefore be divided into mechanical and chemical, the former dealing with the separation of native metals or metallic combinations from enclosing rock and gangue, and with the separation of associated minerals from each other according to their relative specific gravities; and the latter with the resolution of the chemical combinations of the metals with the non-metallic elements and with each other. The separation of the associated minerals and of minerals and metals from the gangue is usually effected by purely mechanical contrivances known as ore-dressing and ore-concentrating machines. Sometimes the metal or mineral is isolated by a process of lixiviation, heat being used (bismuth, sulphide of antimony). I. ORE DRESSING. The dressing of ores is the separation by mechanical means, preliminary to further treatment, of the worthless portions of the material obtained in mining. This art is usually referred to the province of the mining engineer, rather than the metallurgist, because in most cases, where the mines and reduction works belong to separate proprietors, the former are expected to deliver ores to the latter in a suitable condition for treatment. But strictly speaking ore dressing is a metallurgical process. Gillon classifies it as "mechanical metallurgy." Every ore has a valuable and a worthless portion, and there may be also an injurious portion, which causes loss in the treatment. To remove the worthless portion (gangue) and the actively injurious portion, by mechanical means, is the object of ore dressing. In a few instances, such as the washing of coal and the simple panning or sluicing of gold without amalgamation, the separation furnishes, without further treatment, the marketable commodity desired. But these operations, though involving the same principles, are not usually classed as ore dressing; and in most instances the mechanical preparation merely precedes the actual process of reduction. Whether any given ore should be subjected to this preliminary treatment is a question of economy, involving local conditions of expense and the unavoidable loss of

valuable material attendant upon the additional manipulation required. To decide this question, for instance, with regard to an ore that is to be treated by smelting, it must be determined whether the expense of smelting the whole mass of the ore mined would be greater than that of first separating its worthless or injurious contents, and then smelting with better results the smaller quantity of concentrated materials; and also whether in the mechanical separation the loss of valuable material would be so great as to counterbalance the saving in smelting expenses, and the possible gain in purity of product and in completeness of extraction. It is also necessary to determine specially in every case how far the process of preliminary treatment shall be carried. It would not be desirable, even if practicable, to remove every trace of gangue, since some earthy material is requisite for the formation of slag to protect the metal in the hearth of the furnace from oxidation. Simple concentration removes a portion of the worthless gangue, and divides the ore into two parts, usually called "headings" and "tailings." Headings may be made pure only by a loss of valuable material in the tailings; and, *vice versa*, the tailings can be made entirely worthless only by leaving considerable gangue in the headings. The best systems therefore involve the formation of one or more classes of so-called "middlings," or intermediate grades, which may be subsequently separated again. This principle is also important in the treatment of a material containing different ores which cannot be advantageously smelted together. Thus zinc blende, which is very commonly associated with silver-bearing galena, is often poor in silver, and moreover seriously embarrasses the lead-smelting, not only by requiring extra fuel for its own volatilization or fusion in the slag, but also by taking up and removing in its vapors or slags a larger portion of silver than it originally contained. Yet this mineral, if separated, can under favorable circumstances be profitably treated by itself.—The mechanical separation of minerals depends either upon their magnetic properties or their specific gravity. The former principle has been employed to a limited extent in the separation of magnetic iron ores, in a finely divided state, from their accompanying gangue. Both permanent magnets and electro-magnets have been employed; but the process can scarcely be said to have proved an economical success, or to be now in practical operation outside of the laboratory.—Separation by specific gravity is performed in air and water. So-called dry concentrators are chiefly used in localities where water is scarce. The simplest form is that of a bowl or hide, in which auriferous dirt is placed and tossed in the wind, the lighter earthy particles being blown away, while the heavier sands containing the gold return to the vessel. Other air concentrators are winnowing channels, in which the material is separated by a draught

of air, the heavier particles falling first to the floor, and the lighter ones being carried for longer distances; the result is a distribution of the materials on the floor of the channels in the order of their specific gravity. The most complete ore-dressing machines employing air are those in which the current of air is replaced by impulses, somewhat after the manner of the water jigs to be mentioned presently. The apparatus usually employed in dressing ores involves the use of water as a medium, and depends upon the relative periods occupied by bodies of different size, shape, and gravity in falling through water. The most favorable condition for separating ores would be the employment of a liquid exceeding in specific gravity one portion, and exceeded by the other portion, of the materials to be treated. The former would then float, while the latter would sink to the bottom, as in the preparation of fine porcelain clays. But in almost all cases the minerals to be separated sink in water, and a separation must be based on their different rates of sinking, dependent upon variations of specific gravity in different materials, and of size and shape of particles in the same material. In many machines for the separation of minerals by water, those particles which actually fall at equal rates will be brought together; hence, if it is desired to bring together particles of the same mineral (that is, of the same specific gravity) only, the disturbing effect of difference in size must be avoided. In other words, a careful sizing of the material must precede its separation according to gravity. A given quartz sphere will be 4 times as large in diameter, 68 times in volume, and 23 times in weight, as a galena sphere that falls through water at the same rate; and if such a piece of quartz were present with such a piece of galena in the material under treatment, they would not be separated. The separation is not usually effected in still water. In some machines the ore is made to fall against a rising current, or against impulses given by the motion of pistons; in others, the action of a stream of water passing through a trough or over an inclined plane is employed. The sizing is frequently effected beforehand by sieves, but the inclined plane itself may produce a separation according to the size of the particles, by reason of the greater rapidity of the upper surface of the stream, and the greater effect produced by the current upon larger particles. The shape has here an important influence, as determining the retardation of the particle by rolling or sliding friction. The apparatus in which still water is employed includes various kinds of settling tanks. The upward current and impulse is characteristic of the machines known as jigs; while the thin stream of water passing over an inclined surface is a feature of the buddle, the plane table, the rotary table, and the percussion table. The most universally serviceable machine for ore dressing is the "jig" or "jigger." This was originally a simple improvement upon the treatment of ore by

hand on a sieve under water. By plunging the sieve down suddenly under water, and allowing the particles to come again to rest upon it, a separation is effected; and if the stuff has been sized, and the operation has been repeated often enough, the denser particles are found in strata under the less dense. By scraping off the upper layers horizontally, ore and gangue may be separated. The first improvement was that of imparting motion by machinery to the sieve, but it was afterward found more convenient and effective to employ a submerged stationary sieve, and impart a vertical oscillatory motion to the water. This is done by using pistons or elastic diaphragms placed in the sides of the box, or on the top of a lower chamber full of water, and communicating with a lower box through the sieve. An additional feature of recent mechanical jigs is the continuous discharge, by means of which the different classes of separated material are removed without interrupting the operation. It was formerly supposed that coarsely crushed ores only could be effectively treated by jigging; and since ores so crushed usually contain a large proportion of fragments composed of adhering gangue and ore, and therefore possessing a specific gravity different from both gangue and ore, it was supposed that the jig could not be employed for the most delicate separation. But the improvements which have been made in this apparatus permit the treatment by it of much finer material than was formerly practicable, and at the same time have greatly reduced the hand labor and consequently the expense involved in the process. The result has been a great extension of the application of the jig, and the gradual abandonment to a large extent of the more cumbersome buddles and tables, which were formerly considered necessary for the treatment of the finest sands. The "dolly tub" is a very simple machine for separating the particles of crushed ore. It consists of a cylindrical vessel filled with water, in which the ore is rotated by means of revolving arms. When rotation has been maintained long enough, according to the quality and size of the material, the ore is allowed to settle, while the workman jars the table by blows upon the side of the tub with an iron bar, to prevent adhesion upon the inner surface. This machine has been elaborated by Hund, Rittinger, and others, and provided with a continuous discharge. In the machines already described, the material to be worked must previously be carefully sized, but, sometimes it is already too fine to be accurately or rapidly sized in sieves or "trommels," and for this reason resort is had to a different treatment. The material is first separated into "equal-falling" portions, grains constituting each portion being of such relative size and specific gravity that they will sink through water in equal times. Each of these portions is then treated alone upon a machine capable of separating the particles according to their specific gravity. For classify-

ing the equal-falling particles, various machines are employed, in which use is made either of a horizontal stream of water of decreasing rapidity and of considerable depth, or a comparatively shallow, smooth stream, or a vertically ascending column with decreasing rapidity. The *Spitzkasten* or pointed box employs the first of these agencies. These boxes are hopper-shaped, and several of them of different sizes are connected. The water carrying the ore flows into and over the first box, and the heavier particles settle, while the lighter flow on to the second box, and so on. The rapidity of the current is diminished by varying the breadth of the boxes. The vertically ascending column of water is employed in the so-called *Spitzlutter*, a system of conical boxes, in which the water does not flow over as a covering current, but enters at the bottom. Both the flowing current and the ascending current have been combined in some recent forms of pointed boxes. The riffle, so frequently used in placer gold mining, involves the same principle.—The material, having been classified by any of the machines just mentioned into portions of equal-falling particles, must be treated further in order to separate each of these portions according to specific gravity; and for this purpose machines must be employed in which the particles will be affected more in proportion to size than in proportion to weight. Of equal-falling grains, the smallest are of course the densest; hence, the smaller will be mainly ore, the larger mainly gangue. A very thin, smooth stream of water, passing over a plane surface, exerts different forces upon large and small grains lying in the current. The friction on the layer of water next to the bottom is much greater than on the layer above. Hence large grains, the tops of which protrude into the layer above, will be acted upon by a much more rapid current, and will be moved forward, while the smaller grains lying in the lowest layer are unaffected. This is incidentally also a separation according to gravity, since the large grains are specifically lightest. It is essential that the stream should be thin; a deep stream acts upon all points very nearly alike. Another requisite condition is a proper velocity, which depends upon the inclination of the plane. If too nearly horizontal, the current will not move even the coarser particles, and if too steeply inclined it will be so violent as to sweep away fine and coarse alike. The amount of material held in suspension must also be regulated; if the water is too muddy, it will not be free to act on the separate grains, and the grains will act on each other. Keeping the water perfectly clear will effect the most complete sizing, but this condition is unfavorable to the quantity of work performed. The economical medium is found by practical experiment. Among the machines employed for this purpose are the plane table, the buddle, and the percussion table. The first requires little description. It

is an inclined plane, near the head of which the ore is deposited in the form of slime, and acted upon by a stream of water distributed uniformly over the board. To prevent the cutting of furrows or channels in the ore bed, the workman continually smooths and consolidates with a wire brush or piece of plank the layer of concentrated ore deposited near the head of the table. When the table is full of accumulated ore, the water is shut off by means of the riddle, and the layer is divided into four parts, or zones, parallel with the head of the table. The upper zone is concentrated ore; the second zone is usually about as rich as the original material; the third is poor, but still rich enough to pay for reworking; the fourth is too poor for further treatment, and is rejected as tailings. Minor subdivisions may sometimes be made to advantage. The manual labor involved in this process has caused it to be more or less superseded by mechanical contrivances. One of these is the buddle, which may be considered as consisting of a large number of plane tables placed radially round a central point. They may be arranged with their heads together, the ore being fed in the centre and discharged on the circumference, in which case the buddle forms the frustum of a low cone, and is called a convex buddle; or they may be grouped with the tails toward the centre, the feed being on the circumference and the discharge in the centre, constituting a concave buddle. In these machines the tedious operation of maintaining an even surface to the ore layer is performed by revolving arms carrying brushes or scrapers. A concave buddle is usually preferred, by reason of its discharge in the centre, where the working surface is smallest. This secures a maximum force of current for carrying away the worthless material; whereas on the convex buddle the current is strongest in the centre, and is most likely at that point to carry past the proper zone particles of rich ore; while on the circumference, where the discharge takes place, the current is so much spread out as to have lost the power of carrying away the worthless portions of the material. The percussion table is another improvement on the plane table, in which the smoothing and consolidating of the surface of the ore layer is effected by means of a periodical jar communicated to the table itself. This jar is ordinarily given by suspending the table, swinging it from its position of equilibrium, and allowing its backward swing to be stopped by striking against a stationary block. The consolidation of the ore by brushes on the buddle, already alluded to, is not effective for very small particles. The finest slimes, when treated in buddles, remain too loosely on the surface, and permit the formation of furrows or channels; but on the percussion table the shock imparted to the particles thoroughly shakes them together, and consolidates the mass. The percussion

tables until recently employed were stopped at intervals and cleaned up by hand, like the ordinary plane table; and the buddles were treated in the same way, the zones of classified material in the latter case being of course annular. But the most recent practice has given rise to continuously working buddles and percussion tables. The former are known as rotating tables, and are substantially buddles which revolve slowly under feeding spouts, and from which the dressed ore, instead of being allowed to accumulate on the table, is washed off by clean water as soon as the separation of the grains has been effected. These machines, as well as the continuous percussion tables, were perfected by the late Herr von Rittinger of Austria. The rotating tables have been found somewhat complicated and wasteful of water, and require very careful and skillful management; but the continuous percussion tables are pronounced both cheaper and more convenient than the similar machines of the intermittent type. These continuous tables receive their shock sidewise instead of endwise, and the result is a distribution of the ore in peculiar curved zones upon the table. The stuff to be washed is delivered upon the tables at an upper corner. The clear water is furnished by distributors. The tendency of the pulp is to flow down the slope in a direct line; but by means of the lateral percussion the path of the heavier particles is changed, and they are gradually thrown toward the side receiving the shock. The combination of this motion, at right angles to the current of water, with the downward motion of the current, gives to the particles, according to their size and weight, a more or less curved path, and gradually separates the heavier and richer particles from the poor stuff. By the time they have reached the foot of the table the richest portions have been transferred to the corner diagonally opposite to that upon which they entered, while the middlings and tailings are discharged along the lower edge of the table, in the order of their concentration. By placing compartments below the edge of the table, to receive the different discharges, the products of the classification are conducted away separately. The best authorities on this subject are the elaborate treatises in German by Rittinger and Gätzschmann. II. EXTRACTION OF METALS FROM THEIR ORES. The chemical processes employed for this purpose depend, 1, on the affinity of carbon for oxygen; 2, on the mutual reaction of an oxide with the sulphide of a metal; and 3, on the replacement of one metal in combination by another. The reactions in 1 and 2 take place only at high temperatures, while those in 3 may be effected either by fusion or in solution.—1. *Metals reduced from the state of Oxide by Carbon.* The affinity of carbon for oxygen at high temperatures is sufficient to decompose most of the metallic oxides. Even the alkaline metals may be thus obtained. A few of the oxides (alkaline

earths, earths, &c.) cannot be reduced by carbon, but their chlorides are reduced by the alkaline metals. In ordinary metallurgical practice the naturally occurring oxides that are reduced by carbon are iron, tin, zinc, and lead. The ores of iron and tin are exclusively oxides. Zinc occurs both in oxidized condition as carbonate or silicate, and also as sulphide. Lead exists mainly as sulphide, but occasionally as carbonate, phosphate, &c. Metallic zinc is always produced from the oxide; the sulphide must therefore first be converted into oxide before it can be treated for the reduction of the metal. Lead may be prepared both from the oxide and the sulphide, and according to the process employed the sulphide is either treated as such (see below) or oxidized by roasting. The methods employed for reduction by carbon consist either in heating the oxide in direct contact with coal or in exposing it to the action of heated carbonic oxide gas. Iron ore is smelted in a high-shaft furnace, and is reduced entirely by carbonic oxide generated by the partial combustion of the fuel in the lower part of the furnace, where the metallic iron is melted. Tin ore is either smelted in a low-shaft furnace or on the hearth of a reverberatory furnace in contact with fuel. Oxidized lead ore is likewise treated in shaft furnaces. Zinc ore is mixed with fuel and heated in clay retorts. Since the reduction of iron ore is effected at a temperature below the point of fusion of the metal, the latter may be obtained in the solid state having the form of the pieces of ore used (iron sponge); but as ordinarily smelted the metal is fused after reduction. In this fusion it combines with carbon and silicon and forms cast iron. This product, although containing only about 93 per cent. of iron, has manifold applications in the arts. In the preparation of wrought iron, which is nearly pure, cast iron is submitted to an oxidizing smelting to remove the carbon and silicon. Tin and lead are reduced at temperatures above their points of fusion, and are obtained in a molten state, while zinc is only reduced above its boiling point, and is obtained as vapor, which is condensed to a liquid.—2.

Metals produced by the mutual Reaction of an Oxide and Sulphide. This reaction results, in the case of a few metals, in the formation of sulphurous acid gas and the separation of the metal, according to the following general formula: $MS + 2MO = M_2 + SO_2$. The principal examples of this mode of smelting are lead and copper. The sulphides of these metals are partially oxidized, and the oxide thus formed is intimately mixed at a high temperature with the unaltered sulphide, with the result given above.—3. *The Replacement of one Metal by another.* The chemical affinity which the metals possess for the non-metallic elements differs greatly, and those possessing the strongest affinity are capable, in many instances, of driving the weaker out of combination. Advantage is taken of this in the separation

of many of the metals. When sulphide of lead is heated with metallic iron, metallic lead is produced with sulphide of iron, owing to the stronger affinity of iron for sulphur. Antimony is reduced from its sulphide in the same way. This replacement of one metal by another is still more readily accomplished when the metal to be separated is in solution. It is only for the more valuable metals, as gold, silver, and copper, that the so-called wet processes, in contradistinction to the dry or smelting processes, are employed. Silver is produced in both ways. When associated with lead it is smelted by either of the lead processes given above, and is obtained alloyed with the lead. But when the ore or smelting product from which the silver is to be extracted is free from lead or nearly so, the silver may be converted into sulphate and dissolved out by water, or into chloride and dissolved either by a solution of chloride of sodium or hyposulphite of soda or lime. From these solutions the silver may be precipitated by iron or copper, or it may be thrown down as sulphide and this decomposed by iron. Rich silver ores (sulphides) are sometimes added directly to the molten lead in the process of cupellation, in which case the silver is reduced by lead. Copper is also produced to a considerable extent by wet processes. It is rendered soluble by dissolving the native oxides or carbonates, or the oxide produced by roasting the sulphide by acid, and is precipitated by metallic iron. In gold and silver extraction processes, mercury is largely used to collect the finely divided metals, since it combines with them readily, forming an amalgam. When the metals occur native in the ore, they may be directly extracted with mercury. Some natural compounds of silver are decomposed by simple trituration in an iron pan or mortar. If mercury is present, the silver is taken up as soon as set free. In the more refractory ores the silver is converted into oxide or chloride by roasting before treating with iron and mercury. Metallic gold may be rendered soluble and extracted from its ores by means of chlorine. From the solution thus obtained the gold is precipitated by iron (iron vitriol). The production of mercury from its principal ore (sulphide or cinnabar) does not depend on any of the three processes given above. The ore is simply heated with access of air, when the sulphur is oxidized to sulphurous acid and the metal liberated in the form of vapor. (For detailed accounts of processes see the articles on the different metals.)—Not unfrequently an ore after dressing may contain several metals, and the processes involved in the extraction and separation may be very complicated and include the operations of all three classes given above. (See Freiberg smelting process, under LEAD.) The amount of a metal in an ore is often so small that it is necessary to subject the ore to a concentrating process before it is treated for the extraction of the metal. Thus

copper ores which may contain 5 per cent. or less of metal are worked by a process known as matte smelting, whereby the copper is raised to 70 or 80 per cent. by the removal of earthy ingredients and iron. In this process the copper in the ore is collected in a matte which is mainly a combination of iron, copper, and sulphur. The iron is gradually removed in successive operations, until only copper and sulphur are left. From this enriched product the copper is separated by the roasting-reaction process. (See COPPER.) Nickel ores are likewise first smelted to a matte.—The furnaces employed for metallurgical operations may be divided into the shaft or blast furnace, the gas or reverberatory furnace, and the crucible. In the shaft furnace the ore or other metallic compound is charged alternately with the fuel, and a reducing atmosphere, that is, one in which carbonic oxide predominates, always exists. In a reverberatory furnace the fuel does not come in contact with the hearth of the furnace, on which the substance to be heated is placed. The atmosphere here is generally oxidizing, owing to the practical impossibility of obtaining a high temperature without the admission of a slight access of air. In gas furnaces the access of air can be better regulated than with the ordinary reverberatory, but it must not be overlooked that carbonic acid, the product of combustion, gives off oxygen to some metals (as iron) at a red heat. Where a low temperature only is required, a more or less reducing atmosphere may be maintained by limiting the supply of air. But when an active reducing action is required on the hearth of a reverberatory furnace, the substance to be treated is intimately mixed with coal. A covered crucible or retort heated from without is entirely independent of the source and character of the heat, and consequently the nature of crucible smelting depends solely on the substances employed.—The earthy matters associated with the metals in ores are removed in ordinary smelting operations in the form of a fusible compound, which when solidified is generally hard and stony and is called slag or cinder. In iron smelting the slag consists mainly of silica, lime, and alumina. It is rarely the case that an iron ore contains these substances in the proper proportion to form a fusible cinder, and consequently the substance which is deficient must be added. As most iron ores are silicious, limestone is usually added as flux. In copper and lead smelting, the cinder usually contains, besides the earthy bases, a considerable amount of iron in the form of ferrous oxide. The cinder from copper matte smelting is almost exclusively a ferrous silicate. Mill cinder produced in the operation of puddling pig iron is also a ferrous silicate, but the iron contained in it is the incidental and unavoidable result of the oxidizing atmosphere in the furnace necessary for the removal of the silicon and carbon; it does not therefore represent an enriched product, but a waste of iron.—In order to

facilitate the extraction of the metal, it is often necessary or desirable to change the physical or chemical constitution of the ores. This is effected by roasting or calcination. Roasting in its simplest form consists merely in the exposure of the ore to heat, in order to render it friable and porous and thereby more readily reducible. Compact iron ores are often thus treated. Again, an ore may contain volatile ingredients which can be driven off by heat. It becomes thereby enriched, besides being rendered porous. The spathic ores of iron (carbonates) and the brown hematites (hydrates) when heated part with their carbonic acid and water, and are converted, the former into porous magnetic oxide, and the latter into red oxide. This kind of roasting, generally called calcination, is usually effected in low-shaft furnaces or kilns, the heat being generated by fuel charged with the ore, or by the use of gas. The sulphides and arsenides of the heavier metals are often roasted in order to break up existing combinations and to form others which are more susceptible to treatment. This roasting may be either oxidizing or chloridizing. Oxidizing roasting consists in subjecting the ore, or other metallic combination, as matte, in the form of lumps or powder, to the action of heat, with free access of air. It is sometimes conducted in heaps in the open air by piling up lumps of ore or matte with layers of fuel. When sufficient sulphur is present, the pile when once ignited continues to burn without the aid of fuel. This method is always tedious, and generally imperfect. The ordinary method of furnace roasting consists in exposing the ore in the form of powder to the action of heat and air on the hearth of a reverberatory furnace. The ore must be frequently turned and rumbled, so that the oxidation shall proceed uniformly. It is also necessary to avoid a temperature which would sinter or fuse the mass, and thus hinder the complete exposure of the small particles to the air. To obviate the necessity of hand labor in turning the charge, and also to hasten the roasting, mechanical appliances have been employed, such as revolving chambers and hearths. It has also been found that showering the ore or matte in fine powder into a heated chamber or stack is a very expeditious method of roasting. Gerstenhöfer was the first to introduce this practice. His furnaces are rectangular chambers provided with iron bars of triangular section arranged at regular intervals, base uppermost. The time of exposure in falling is thus somewhat prolonged. The sulphides of the different metals behave very differently when roasted. In general the metal and sulphur are both oxidized; part of the latter passes off as sulphurous acid, which under favorable conditions can be utilized in the production of oil of vitriol; and part is converted into sulphuric acid, which combines with the metallic oxide. At a high temperature this sulphuric acid may be driven off, either wholly or in part, and the oxide left.

When arsenic and antimony are present, the reactions become much more complicated and complete roasting more difficult. Gold, mercury, and silver may be reduced to metal by roasting, owing to their feeble affinity for oxygen at high temperatures. Some sulphides are difficult to roast, owing to their fusibility (sulphides of lead, bismuth, antimony, &c.). Chloridizing roasting has for its object the conversion of silver in ore or matte into the condition of chloride, in which form it may be dissolved, or directly treated with metallic iron to separate the silver, as mentioned above. The chlorination of silver is effected by the addition of common salt to the charge to be roasted, which is decomposed by the sulphuric acid generated by the oxidation of the sulphur with the liberation of hydrochloric acid. The methods employed are in general the same as those used in oxidizing roasting. The revolving cylinder (Brückner's) and the showering furnace (Stetefeldt's, on the principle of Gerstenhöfer) are largely used, and are found to give good results.—In many smelting operations, especially where ores of complex composition are used, an alloy of several metals is frequently produced. Thus the furnace or work lead from many ores contains copper, antimony, silver, gold, and other metals. The separation of the metals from each other is based on their relative oxidability, on the solvent action of metals and metallic oxides on each other, on difference in fusing point, on crystallization, and on solubility in acids. Examples of these methods will be found in the accounts of the different metals. It will suffice here to mention briefly the separation of lead from silver by the oxidation of the former, and the removal of copper and other metals at the same time, by the solvent action of litharge on their oxides (cupellation); the separation of silver from copper by alloying the latter with lead, and subsequently removing the lead with the silver by heat (liquation); the removal of silver from lead by zinc (Parkes's process) and by crystallization (Pattinson's process); and the separation of silver from gold by acids.—Metals occur in the arts either cast as ingots or in finished forms, or wrought by hammering, rolling, and drawing into sheets, rails, wire, &c. These mechanical processes are intimately connected with and dependent upon the physical properties of the different metals and on their purity.—See "Elements of Metallurgy," by J. Arthur Phillips (London, 1874).

METAPHYSICS. See PHILOSOPHY.

METASTASIO, Pietro Antonio Domenico Bonaventura, an Italian poet, born in Rome, Jan. 3, 1698, died in Vienna, April 12, 1782. He is said to have excelled in improvising verses at the age of 10. Gravina, an eminent jurist and scholar, adopted him as a son, changing his name of Trapassi to that of Metastasio (from the Gr. *μετάστασις*, change or transfer), and preparing him for the profession of the law, but without discouraging his studies in classical

and dramatic literature, in which he advanced so rapidly that at 14 he wrote a tragedy, *Giustino*, after the Greek model. He accompanied his patron to Naples, where his talents gained him many friends. While continuing the study of jurisprudence, he took holy orders, whence he was sometimes called Abbate. Gravina bequeathed him in 1718 a considerable fortune; but the young poet squandered most of it within two years, and again applied himself to the study of the law. Soon returning to his favorite pursuit, he produced an epithalamium and the drama *Endimione*. Under the patronage of the viceroy of Naples he wrote *Gli orti esperidi* and *Angelica*, the latter after Ariosto. The part of Venus in the former play was performed by Maria Bulgarini, or La Romanina, who was at that time the leading Neapolitan prima donna, and whose appreciation of Metastasio's genius laid the foundation of a most intimate relation, the poet writing under her inspiration his *Didone abbandonata* (1724), which was set to music by Sardi and other composers, and established Metastasio's fame. He accompanied the signora to Rome, where his *Semiramide* (set to music by Meyerbeer in 1819), *Ezio*, *Alessandro nell' India*, *Catone in Utica*, and *Artaserse* were performed in rapid succession. In 1729 he went to Vienna, where he succeeded Zeno as imperial laureate. In 1733 appeared his *Olimpiade*; and one of his most celebrated lyrical dramas, *La clemenza di Tito*, was performed in 1734, and was again set to music in 1790 by Mozart. The death of the emperor Charles VI. in 1740, and the outbreak of war, led to the closing of the theatre in which he had been employed, and he now devoted himself to literary pursuits, chiefly to translations and annotations of Greek writers. In 1744 appeared his plays of *Antigone* and *Ipermestra*. After the return of peace he wrote *Il re pastore* (1751), which was enacted by the ladies of the imperial family. His last operatic play, *Il Ruggiero*, was produced at Milan on occasion of the marriage of the archduke Ferdinand (1771). His last occupation was the superintendence of the magnificent Paris edition of his works. Metastasio was among the first to recognize the genius of Mozart, and to express his admiration of a comic opera which the composer, then only 12 years old, had set to music in 1768. His best known oratorios are *La morte d'Abele*, *Isacco*, and *La passione*; and his most popular cantatas are *La libertà*, *La primavera*, and *La partenza*. A *catalogue raisonné* of his compositions is given by Dr. Burney. The best editions of his works are those in 12 vols. (Paris, 1780-'82), and 20 vols. (Mantua, 1816-'20).—See Burney, "Memoirs of the Abbate Metastasio," with translations of his principal letters (3 vols. 8vo, London, 1796). The best Italian sketch of his literary career is by Mauro Boni in his edition of Metastasio's works (Padua, 1811). His "Dramas and Poems" were translated into English by J. Hoole (3 vols., London, 1800).

METASTASIS (Gr. *μετάστασις*, translation), a change in the seat of a disease, attributed by the humorists to a translation of the morbid matter from a part previously diseased to another, and by the solidists to a translation of the irritation. It has been a matter of dispute whether such an action as metastasis really ever takes place, or whether it is not simply an extension of the disease. The frequent sudden transference of the seat of gout and acute rheumatism would seem to favor the idea that there is change of seat without any progressive extension. There are some diseases, however, which were formerly considered as metastatic, that have been shown to be properly not so classified. (See MILK LEG.)

METCALFE, a S. central county of Kentucky, watered by Big and Little Barren rivers; area, about 500 sq. m.; pop. in 1870, 7,934, of whom 861 were colored. The surface is rolling and the soil fertile. The chief productions in 1870 were 38,818 bushels of wheat, 276,207 of Indian corn, 62,462 of oats, 1,310,381 lbs. of tobacco, 17,718 of wool, 84,350 of butter, and 1,045 tons of hay. There were 2,327 horses, 1,368 milch cows, 2,385 other cattle, 8,701 sheep, and 12,966 swine. Capital, Edmonton.

METCALFE, Frederick, an English clergyman, born in 1817. He graduated at St. John's college, Cambridge, in 1838, and subsequently was elected a fellow of Lincoln college, Oxford. In 1848 he became head master of Brighton college. He has published "The Oxonian in Norway" (2 vols., 1856); "The Oxonian in Thelemarken" (2 vols., 1858); "History of German Literature" (1858); and "The Oxonian in Iceland" (1861). He has adapted from the German of A. Becker sketches from the domestic life of the ancient Romans and Greeks, under the titles "Gallus" (1844; 2d ed., 1853) and "Charicles" (1845; 2d ed., 1854).

METELLUS, a Roman plebeian family of the *Cæcilia gens*. The following are its most distinguished members. **I. Lucius Cæcilius**, commander against the Carthaginians in the first Punic war, defeated Hasdrubal in 250 B. C., and was honored with a triumph. He was twice consul, once dictator for the purpose of holding the comitia, and pontifex maximus during the last 22 years of his life. He lost his sight while rescuing the Palladium from fire, and died about 220. **II. Quintus Cæcilius**, son of the preceding, served successively as plebeian ædile, curule ædile, consul, proconsul, and dictator for the purpose of holding the comitia. He fought in the second Punic war against Hasdrubal in Spain, and against Hannibal in Bruttium, and survived the final victory over the Carthaginians many years. **III. Quintus Cæcilius Metellus Macedonicus**, son of the preceding, commanded as prætor in Macedonia, where he defeated and made prisoner the usurper Andriscus (148), fought successfully against the Achæans (146), and as consul against the Celtiberians in Spain. He was censor in 131, died in 115, and was carried to

the funeral pile by three sons who had officiated as consuls, and a fourth who was candidate for the same dignity. The first, second, and fourth were afterward distinguished by the surnames of Balearicus (from the conquest of the Balearic isles), Diadematus, and Caprarius. **IV. Lucius Cæcilius Metellus Dalmaticus**, nephew of the preceding, officiated as consul, censor, and pontifex maximus, received his surname from his victories over the Dalmatians in 119, and was active against Saturninus 19 years later. **V. Quintus Cæcilius Metellus Numidicus**, brother of the preceding, commanded as consul in 109, and as proconsul in the following year, against Jugurtha in Numidia, but had the mortification to see the fruit of his victories, the honor of a final triumph over the enemy, snatched from his hands by Marius, his legate, who supplanted him in the opinion of the Roman people, and was elected consul to succeed him in command. He was, however, allowed a triumphal entry into Rome (107), and subsequently elected censor (102). Two years later Marius concerted with the tribune Saturninus a scheme to destroy the influence of Metellus, who was regarded as the foremost leader of the aristocratic party. Saturninus moved and carried through an agrarian law, with an additional enactment requiring the senators to take an oath of fidelity to the same, under penalty of being expelled the senate. Metellus remained faithful to his convictions, suffering with calm resignation not only expulsion from the senate, but banishment from Rome. He retired to Rhodes, whence he was recalled in the following year. His orations are praised by Cicero, and were still admired in the time of the Antonines. **VI. Quintus Cæcilius Metellus Pius**, son of the preceding, received his surname from his filial efforts to bring about the recall of his father from exile. He commanded in the social war, tried in vain to save Rome from Marius and Cinna in 87, crossed over to Africa, and subsequently fought against the Marian party in Umbria, Cisalpine Gaul, and Spain, where his efforts proved insufficient against Sertorius. He was consul with Sulla in 80, and died while pontifex maximus, being succeeded by Julius Caesar (63). **VII. Quintus Cæcilius Metellus Celer**, great-grandson of Metellus Macedonicus, served as legate under Pompey in Asia, and as prætor in Italy in the year of Cicero's consulship (63), with whom he actively coöperated against Catiline and his followers. On the outbreak of the war, being intrusted with the command in Picenum and the Senonian district in upper Italy, he greatly contributed to the defeat of Catiline by blocking up the passes of the Apennines, and thus compelling him to face the army of Antonius, Cicero's colleague. In 62 he was sent as proconsul to Cisalpine Gaul, in 60 officiated as consul with Afranius (opposing the schemes of Pompey, who was better served by his colleague as well as by his younger brother Ne-

pos), and died in the following year, it was suspected from poison administered by his profligate wife Clodia. **VIII. Quintus Cæcilius Metellus Pius Scipio**, the adopted son of Metellus Pius. (See **Scipio**.) **IX. Quintus Cæcilius Metellus Creticus**, received his surname from the conquest of Crete, whither he was sent as consul in 69, and whence he returned in 66, but was prevented by his political opponents from celebrating a triumph till after the defeat of Catiline, during whose agitation he had prevented an insurrection of the slaves in Apulia.

METEMPSYCHOSIS (Gr. *μετά*, denoting change, and *ψυχή*, soul), the supposed transmigration of the soul from one body to another. It is a feature in Brahmanism and Buddhism, which represent the migration after death into the body of a higher or lower animal as a reward of virtue or penalty for vice. The soul may even deteriorate into the vegetable or mineral world. According to Herodotus, the Egyptians were the first to entertain this doctrine. They believed that the soul was clothed successively with the forms of all the animals that live on the earth, and that it then returned after a cycle of 3,000 years into the body of a man, to recommence its eternal pilgrimage. The later Pythagoreans maintained that the soul has a life peculiar to itself, which it enjoyed in common with demons or spirits before its descent to the earth, and that there must be a degree of harmony between the faculties of the soul and the form which it assumes. Plato adopts and treats the doctrine in his "Phædo," maintaining the preëxistence of the soul before it appears in man, of which condition it retains dim reminiscences; and after death, according to its peculiar qualities, it seeks and chooses another body. Every soul, according to him, returns to its original source in 10,000 years. After completing each life it spends 1,000 years in the infernal world in a condition corresponding to that life. The idea appears in the speculations of the Neo-Platonists, and in the cabala of the Jews. Porphyry gave to it its most definite development in Neo-Platonic thought. The cabalists thought that the destiny of every soul was to return into mystical union with the divine substance, but that in order to do this it must first develop all the perfections of which it has the germ within itself. Origen, in his work "On Principles," is supposed to hold this doctrine, to find in it the final cause of creation, and to maintain that God gave existence to the world as a place of purification for those souls which had sinned in heaven; and this explains why the Deity introduced so many apparent imperfections into his work. But Origen's book exists only in the Latin translation, *De Principiis*, by Rufinus, who is believed by modern critics to have altered the original, and to have interpolated some of his own notions. This idea, attributed to Origen, was also held by the Gnostics and Manicheans, and by the druids, and is still believed by the Druses.

METEOR (Gr. *μετέωρος*, lofty, in the air), any phenomenon of short duration occurring in the atmosphere. Rain, snow, hail, fog, and dew are meteors distinguished as aqueous; the movements of the winds constitute the varieties of aerial meteors; luminous meteors are the singular phenomena displayed by the action of the aqueous particles diffused through the atmosphere upon the rays of light, such as *fata Morgana*, halo, mirage, rainbow, &c., and may also include the *aurora borealis*; and igneous meteors are such phenomena as lightning, *aërolites*, shooting stars, &c. Most of these are described in this work under their own names.—In common language, the term meteor is applied only to those bodies which, as globes of fire or as shooting stars, are occasionally seen darting through the heavens at unknown distances from the earth, and in undetermined paths. Sometimes exploding and projecting upon the earth fragments of stone called meteoric iron, they are proved to be solid bodies in a state of intense heat, and are then known as *aërolites* or *meteorolites*. In ancient times these bodies were witnessed in different parts of the earth, and their appearance was chronicled as among the most wonderful natural exhibitions. The Chinese records of such phenomena extend back to 644 B. C.; and from the 7th century B. C. to A. D. 333, 16 falls of *aërolites* are recorded in the astronomical annals of the Chinese. By the Greeks and Romans in the same period accounts are preserved of only four such falls. Humboldt says that it is remarkable that the Ionian school, in accordance with the present opinion, early assumed the cosmical origin of meteoric stones. Anaxagoras of Clazomenæ held that the meteors are masses torn away from the earth by the violence of the rotation; and that between the earth and the moon there revolve other dark bodies, which can produce eclipses of the moon. Diogenes of Apollonia, as recorded by Stobæus, also taught that dark masses of stone move with the visible stars and remain unseen by us. Plutarch in the life of Lysander (cap. xii.) expressly declares that falling stars "are really heavenly bodies, which from some relaxation of the rapidity of their motion, or by some irregular concussion, are loosened and fall, not so much upon the habitable part of the globe as into the ocean, which is the reason that their substance is seldom seen." The nature and movements of the meteoric bodies which fall upon the earth have already been considered under **AËROLITE**. But some of the most extraordinary meteoric displays, of the nature of fire balls or bolides, and of shooting stars, unaccompanied by falls of stone, may properly be noticed in this place. The bolis is the fiery body from which *aërolites* are precipitated upon the earth; but many such bodies pass across the heavens, and sometimes explode and disappear, leaving behind no vestiges of their solid materials. They appear singly at irreg-

ular periods, and move with great rapidity across the sky, exhibiting sometimes a dazzling brilliancy, greater than that of the sun at noonday, as is remarked by Humboldt of one seen at Popayan in 1788. A luminous train follows them, and their path has been known to remain brilliant for several minutes after they have disappeared. Admiral Krusenstern, indeed, in his "Voyage," describes a fire ball the train of which shone for an hour after the body had disappeared, scarcely moving during this time. They send forth vivid scintillations and present various bright colors, and the same meteor is differently described as seen from different places. Often they divide into two or more bodies which move along together, and sometimes they explode with a report like heavy thunder. They are of various apparent sizes, occasionally exceeding that of the moon. On Feb. 6, 1818, one was seen in England about 2 P. M. descending vertically and shining with a light equal to that of the sun. Dr. E. D. Clarke, who described this in the "Annals of Philosophy," vol. xi., p. 273, was of opinion that meteorolites fell from this body; and in Lincolnshire it was reported that a hissing noise accompanied it, and a trembling of the earth was felt like the shock of an earthquake. The records of fire balls seen in the evening are very numerous. They appear at no particular season, and are limited to no particular portions of the earth, though most of the observations have been recorded in Europe. In 1623 one was seen over Germany, and described by Kepler. In 1676 one passed over Italy from the direction of Dalmatia about two hours after sunset, and disappeared toward Corsica. At Leghorn it was heard to explode, and fragments from it fell into the sea. Its height was estimated by Montanari at 38 m. Halley describes in the "Philosophical Transactions," No. 360, a meteor of extraordinary brilliancy which appeared over England in 1719 about 8½ P. M. It suddenly illuminated the streets of London, causing the stars to disappear, and the moon, which before was shining brightly, to be hardly visible. The eye directed toward it could scarcely bear its brilliancy. It moved like a falling star at a height estimated at 60 to 70 m., and with a velocity of 300 to 350 m. in a minute; through Devon and Cornwall and on the opposite coast of Brittany a loud explosion was heard proceeding from it. On Aug. 18, 1783, at 9 P. M., another very remarkable meteor of this character was seen over a large part of Europe from the north of Ireland to Rome. It crossed the zenith at Edinburgh, appearing single and well defined, of a greenish shade, and with a tail; but at Greenwich it had the appearance of two bright balls with other luminous bodies following it. Its height was estimated to be above the limits of the atmosphere, its speed more than 1,000 m. a minute, and its diameter more than a mile. Cavallo describes its bursting and the noise of the explosion, which was 10 minutes in

reaching the earth. Bowditch describes, in the "Memoirs of the American Academy," a meteor seen Nov. 21, 1819, at Danvers, Mass., and in Baltimore, Md., the diameter of which appeared to be half a mile. Its direction was S. 44° W., and its height, at first 38 m., was soon reduced to 22 m. Two minutes after its disappearance a rumbling noise was heard which lasted longer than a minute. On the evening of July 20, 1860, about a quarter before 10 o'clock, a meteor passed over the state of New York, from the west, being seen on Lake Erie, and soon afterward at Buffalo, Albany, New York city, New Haven, Newport, R. I., and New Bedford, Mass. At the south it was visible in the state of Delaware. By many observers it was at first supposed to be a display of rockets or of Roman candles; and all had the impression that its elevation was only a few hundred feet. From a vessel off Sandy Hook it appeared to fall into the sea at a short distance. First appearing as a single body, it was observed to separate into two balls, which kept along together, emitting sparks and what appeared to be flames. A table of meteors and meteoric showers given in Izarn's *Lithologie astronomique* includes one of iron in Lucania, 54 B. C.; one of mercury (!) in Italy, of unknown date; a fall of about 1,200 stones, one of which weighed 160 lbs. and another 60, at Padua in 1510; sulphurous rains at Copenhagen in 1646 and in the county of Mansfeld in 1658, and a shower of sulphur at Brunswick in October, 1721; a shower of fire at Quesnoy, Jan. 4, 1717; one of sand lasting 15 hours in the Atlantic, April 6, 1719; and extensive showers of stones at Aden, July 24, 1790, and in France, May 15, 1864. (See *ÆEROLITE*.)—Falling stars resembling small bolides are often seen on a clear night shooting at the rate of four or five an hour across the sky. These are termed "sporadic" meteors, in contradistinction to the "periodic," which at certain periods appear often in vast numbers like showers of fire. Displays of this kind are recorded as occurring in October, 902; Oct. 19, 1202; and Oct. 21, 1366 (O. S.). Each time the stars are said to have been in motion all night, falling like locusts, and in numbers which no one could count. More modern occurrences of this phenomenon were observed on the night of Nov. 9–10, 1787, in southern Germany; and after midnight of Nov. 12–13, 1799, as described by Humboldt and Bonpland, in Cumaná. The same phenomenon was also observed as far south as the equator, and over North America, even to Labrador and Greenland, and on the other side of the Atlantic in Germany. From the bearing and course of the meteors at different points, their elevation was computed to be 1,419 m. In 1818 meteoric displays of great brilliancy were seen on the same night of Nov. 12–13, in England, and again in 1822 at Potsdam in Brandenburg. In some of the exhibitions about this period a deposit of dust was observed upon the surface of the water,

on the buildings, and other objects. On the same night in 1831 and in 1832, the same phenomenon reappeared in Europe and America. But the year 1833 is memorable for the most magnificent display on record. This was on the same night of November also, and was visible over all the United States, and over a part of Mexico and the West India islands. Together with the smaller shooting stars, which fell like snow flakes and produced phosphorescent lines along their course, there were intermingled large fire balls, which darted forth at intervals, describing in a few seconds an arc of 30° or 40° . These left behind luminous trains, which remained in view several minutes, and sometimes half an hour or more. One of them seen in North Carolina appeared of larger size and greater brilliancy than the moon. Some of the luminous bodies were of irregular form, and remained stationary for a considerable time, emitting streams of light. At Niagara the exhibition was especially brilliant, and probably no spectacle so terribly grand and sublime was ever before beheld by man as that of the firmament descending in fiery torrents over the dark and roaring cataract. It was observed that the lines of all the meteors if traced back converged in one quarter of the heavens, which was γ Leonis Majoris; and this point accompanied the stars in their apparent motion westward, instead of moving with the earth toward the east. The source whence the meteors came was thus shown to be independent of the earth's rotation and exterior to our atmosphere. As computed by Prof. Denison Olmsted of New Haven, it could not have been less than 2,238 m. from the earth. Three successive annual returns of this phenomenon on the same night led astronomers on both sides of the Atlantic in the following years to watch for its recurrence; and displays more or less brilliant, but not by any means equal to that of 1833, were witnessed in different places in Europe or America every year till and including 1839. They were again observed on the night of Nov. 12-13, 1841 and 1846, and again in 1866 and every following year till 1871 inclusive. But it is not alone in November that periodic exhibitions of the fall of meteors have been observed. It is found that they often occur about the 10th or from the 9th to the 14th of August; and Humboldt named other periods that are likely to prove of the same interest, as about the 22d to the 25th of April, between the 6th and 12th of December, the 27th and 29th of November, and about the 17th of July. He noticed the singular coincidence which different observers have remarked in the great brilliancy of the aurora borealis during the fall of the meteors. Prof. Olmsted early suggested that the meteors probably emanate from a nebulous body, which revolves around the sun in an elliptical orbit, the aphelion of which meets the orbit of the earth at the times of the annual exhibitions. The nebular character is inferred from the

fact that none of the meteors, though they fall toward the earth with prodigious velocity, ever reach it in a solid state, all being dissipated in the atmosphere, and no material substance found to indicate their nature. Arago adopted a view similar to that of Olmsted. He suggests that the meteoric bodies may constitute a stream in the form of an annular zone, within which they pursue one common orbit; that there are several such streams, which intersect, each at its own period, the earth's orbit; and that through each the myriads of small cosmical bodies are irregularly dispersed. But the demonstration of the real orbits pursued by these bodies (at least in the case of the more remarkable periodical showers) belongs to the years following the display of Nov. 13-14, 1866. Prof. Newton of Yale college had predicted the recurrence of a great display of November meteors, such as had been seen in the years 1799 and 1833, for the year 1866; and he even announced as the probable hour of the display early morning in America. He was within a few hours of the truth, the display occurring during the early morning in Europe, and closing before morning began in America. European astronomers noted the point in the heavens whence the meteors seemed to radiate, not far from the star γ Leonis, as in 1833. Then followed an inquiry into the orbit of the meteors. Prof. Newton had indicated five orbits as capable of explaining the recurrence of great displays about thrice in a century. Of these the three most probable were: first, a year and $\frac{1}{3}$ part; secondly, a year less $\frac{2}{3}$ part; and thirdly, 33 $\frac{1}{3}$ years. Prof. Newton considered the last named period improbable, because it implied an orbit extending beyond the orbit of the distant planet Uranus. He therefore regarded a period of rather more or rather less than a year as probably the true period of these meteors. But just at this time a remarkable discovery was made by Schiaparelli of Italy. Noticing that the comet II., 1862, passed the earth's orbit nearly at the place she occupies on Aug. 10-11, he was led to inquire whether the path followed by the comet resembled that traversed by the August meteors, assuming that they have the same period of revolution as the comet (about 124 years). He found the agreement so close as to leave no doubt of the existence of a real association between the August meteors and the large comet of 1862. This will be seen from the following comparison:

ELEMENTS.	Comet of 1862.	August meteors.
Longitude of perihelion.....	344° 41'	343° 38'
Longitude of ascending node...	137 27	138 16
Inclination	66 25	64 3
Perihelion distance	0.9626	0.9643
Period.....	123.74	.....
Motion.....	Retrograde.	Retrograde.

Astronomers therefore began to regard as not improbable the theory that the true period of the November meteors is about 33 $\frac{1}{3}$ years.

Peters, Temple, Leverrier, and other astronomers calculated the path on this assumption, and then they inquired whether any known comet possesses a similar path. By a singular coincidence, a telescopic comet had been found that very year, 1866, which traversed an orbit so near to that obtained for the meteors as to leave no doubt of the identity of the two orbits. The comparison is as follows:

ELEMENTS.	November meteors.	Temple's comet.
Perihellion distance.....	0.9898	0.9765
Eccentricity.....	0.9038	0.9054
Semi-axis major.....	10.840	10.824
Inclination.....	15° 8'	7° 18' 1"
Longitude of descending node..	51° 23'	51° 26' 1"
Period.....	85.25y.	85.176y.
Motion.....	Retrograde.	Retrograde.

But the matter was removed from the region of mere probability by the researches of Prof. Adams, the well known English astronomer. Analyzing the perturbative effects of the planets upon the members of the November meteor system, on the various assumptions pointed out by Prof. Newton as mentioned above, he found that the actual changes taking place in the position of the meteors' node (changes indicated by the gradual alteration of the date of the shower) imply an orbit extending so as to bring the meteors under the disturbing influence of the giant planets. Hence the recurrence of great displays thrice in a century can only be explained by the last assumption of Newton, assigning to the meteors a period of $33\frac{1}{2}$ years or thereabouts. Adams selected a period of $33\frac{1}{2}$ years, and found the nodal changes satisfactorily accounted for. Since then the identity of another system, the meteors of Nov. 27-29, so far as their path is concerned, with the short-period comet called Biela's, has been satisfactorily demonstrated, by the occurrence of a shower (predicted on that assumption) on Nov. 27, 1872. More than 100 meteor systems are now recognized, not in all or in most cases by the periodic recurrence of great displays, but by the existence of distinct radiant points. Even 10 or 12 meteors only, seen on the same night, can be safely assigned to a single system, when they are all found to radiate from nearly the same point of the star sphere.—There is every reason to believe that meteoric astronomy is as yet only in its infancy, and that the combined study of meteor systems and comets will throw great light on many most interesting subjects of astronomical research. Some of the researches of Prof. Kirkwood into the relations presented by comets seem very promising in this respect.

METEOROLOGY (Gr. *μετέωρος*, lofty, and *λόγος*, discourse), the description and explanation of the phenomena peculiar to the atmosphere of the earth. On the atmosphere and its changes depend the development of life, both vegetable and animal, the currents and the navigation of the ocean, and even the

great changes that have been wrought in geological ages by superficial disintegration and erosion. The consideration of these and kindred subjects gives rise to branches of science that may be considered as applications of meteorology proper, which should be restricted to the simple consideration of the atmospheric phenomena themselves, and the laws which produce them. As a science of observation, generalization, and induction, our present knowledge of meteorology dates from Aristotle; but as a deductive science, and one deserving to be ranked with astronomy, chemistry, and physics, its history is confined to the past 25 years. In this article we shall present in brief some of the more important general statistics, thus representing the results of the observations by which deductive theories must be tested, and shall conclude with a few words on the latter.

—**INDUCTIVE METEOROLOGY.** Our review of the inductive science will be divided into sections on the constitution, the temperature, the movement, the moisture, and the pressure of the atmosphere, in which arrangement we follow the very valuable treatise of Schmid.—1.

Constitution and Properties of Air. To Priestley and Scheele (1774) we are indebted for our first knowledge of the chemical constitution of the atmosphere as a mixture of oxygen and nitrogen; to these constituents Bergman in the same year added carbonic acid gas as the third component; of the other gases that are present in very small quantities, excepting the vapor of water, it is not necessary to make further mention. The proportions by weight of the previously mentioned gases in the air over the Atlantic ocean are very nearly as follows: nitrogen, 77 per cent.; oxygen, 23 per cent.; carbonic acid gas, $\frac{1}{100}$ of 1 per cent. The weight of one litre (61.027 cubic inches) of air, at 32° F., and a barometric pressure of 29.9 inches, is 1.293187 grammes (19.9569 grains), as determined by Regnault (1847). A unit's volume of dry air at the temperature of 32°, if free to expand, increases to 1.3665 on being heated to the temperature of 212°. The increased pressure experienced on heating from 32° to 212° a volume of dry air confined within the same space is in the ratio of 1 to 1.36706. The specific heat of air is usually assumed as unity, and the increase of temperature due to a sudden condensation of any portion of it into a smaller volume is about 10° for a diminution in volume of $\frac{1}{10}$, assuming that the air originally is at a temperature of 32° and a pressure of 30 inches. The coefficient of viscosity of air is, according to Maxwell (1872), in British measures, 0.0825 at temperature 32°. The altitude and figure of the atmosphere are terms to which, strictly speaking, no exact definition can be given, since it is not yet certain that the rarefied gases in its upper portion do not merge by insensible degrees in the ether of interstellar space. On the other hand, the only portions of the atmosphere that have any important bearing upon meteorological phenomena are

those below which the phenomena of twilight, the aurora, and shooting stars take place, and these are generally confined to an altitude less than 100 m. above the earth's surface. At an altitude of 12 m. the air has a density one tenth of that which it has at the surface of the earth; that is, at that altitude the average barometric pressure would be three inches, and it is not likely that any changes take place at this height that are appreciable at the surface of the earth. The elevations of the mountains on the earth's surface bear a very appreciable ratio to the altitudes of the cloud-bearing and storm-producing strata of the air; in fact, these latter nearly all lie far below the summits of the highest ranges; and, as a consequence, the distribution of the elevated portions of the continents is a very important factor in meteorology. Of equal or even more importance is the relative position of the land and oceans. Not only is the ocean the principal source of the moisture in the atmosphere, but its influence is felt in a very different way. The power of absorbing and radiating solar heat is very great for all vegetable structures, such as the forests and prairies present; solid earth and rocks possess these properties in a far less degree, and even lower than these in the scale must be placed the ocean water. On the other hand, the specific heat of the earth is so much less than that of water, that the same amount of heat received from the sun upon each will affect the temperature of the air over the land nearly twice as much as that over the ocean.—2. *Temperature.* Atmospheric temperatures are almost uniformly measured by means of the mercurial or the spirit thermometers, the air thermometers being at present employed only in researches of extreme delicacy. (See THERMOMETER.) The heat found within our atmosphere may be considered as coming from six sources: 1, that peculiar to the interior of the earth; 2, that received from the stars; 3, that received from the moon; 4, that received from shooting stars; 5, that produced by friction of tides, winds, &c.; 6, that received from the sun; all which should be added to that originally possessed by the atmosphere. Considering the original heat as tending continually to be radiated and lost in space, the true meteorological problem is to determine how this loss is made up from the six sources just enumerated. 1. That the interior of the earth is in general warmer than the surface is shown by observations of temperature in deep springs, wells of water, and mines, and by the phenomena of volcanoes and geysers, and is very plausibly demonstrated by all seismological theories. (See EARTHQUAKE.) As an average for the whole earth, and especially applicable to the temperate zone, the temperature at a depth of 80 to 100 ft. is constant, showing that at this point we reach the surface of equilibrium between the conduction of heat from the interior outward, and the effect of the radiation from the earth's sur-

face. The only known exception to this rule is found in the northern portion of Siberia, where at a depth of 400 ft. the temperature is still 10° below the freezing point. On account of the slow conducting power of the materials of the earth, the superficial layer of 80 ft. in thickness should be viewed by the meteorologist not as a medium through which any important part of the interior heat of the earth is conducted to the atmosphere, but rather as a storehouse of the solar heat that enters into the ground, and thus equalizes the daily and annual changes of temperature. Nevertheless, the quantity of heat conveyed into the atmosphere by the circulation of air within mines, by hot springs, and by volcanoes, is perhaps barely appreciable, and is for the entire globe possibly equivalent to an elevation of $\frac{1}{100}$ ° F. in the temperature of the entire atmosphere. 2. Since the earth is in the centre of a celestial vault thickly studded with stars, each of which radiates heat in all directions, its tendency is to assume a temperature higher than that which prevails throughout the interstellar spaces; the latter being estimated by Pouillet at about -222° F., while the temperature of the earth due to the stellar heat would be -128° F. 3. The heat radiated from the moon to the earth, though exceedingly small, has been measured by Lord Rosse ("Philosophical Transactions," 1873). The greater part of this heat is absorbed by the aqueous vapor of the atmosphere before it can reach the earth's surface. The principal effect of the lunar heat is therefore probably exerted in warming the upper layers of air, and in dissipating the clouds. The surface of the moon as heated by the sun attains to its maximum temperature a few days after the full moon, at which time its influence on the clouds and on the rainfall is probably barely appreciable at stations favorably situated, though Klein (1868) and Wierzbicki (1873) have shown it to be inappreciable in the interior of Europe. 4. The numerous shooting stars that daily enter the earth's atmosphere bring into it an appreciable quantity of heat, as is evident by their own combustion and dissipation; but as yet no accurate knowledge on this point is available. This heat is a simple case of the conversion of force into heat, and its amount could be calculated had we any positive information as to the mass of the meteors. 5. A small fraction of the energy of the earth's daily rotation is by friction converted into heat, which passes from the ocean to the atmosphere and exerts a slight warming influence. For the further consideration of this obscure subject, see Ferrel, "Tidal Researches" (Washington, 1874). 6. Solar radiation produces on the earth both chemical and optical as well as thermal effects. This is subject to very slight fluctuations, connected in some unknown way with the variations of the solar spots; the frequency and extent of the latter vary in a period of 11½ years, and possibly also in a period of 55 or 56 years.

Attempts have been made to demonstrate other periods, of which perhaps the only one whose existence is plausible appears to agree with the time of rotation of the sun upon its axis. We are therefore justified in considering the intrinsic radiation from the sun as very approximately constant, and the diurnal and annual variations of terrestrial temperature depend upon the position of the station on the earth's surface, and the position of the earth's axis of rotation in reference to the annual orbit described by the earth about the sun. The quantity of heat received by any surface varies directly as the time of exposure and as the sine of the sun's altitude, and inversely as the square of the sun's distance. According to Lambert (1770) and Meech (1855), the sun's daily intensity is proportional to the cosine of the latitude. At either pole the intensity in midsummer is one fourth greater than on the equator; this arises from the fact that daylight on the equator lasts but 12 hours, while at the pole the sun shines throughout the whole 24 hours. In general, from May 10 to Aug. 3 the sun's vertical intensity over the north pole is greater than upon the equator. In the temperate zone the temperature of the air attains its maximum about one month after the maximum of the sun's intensity; in this interval therefore the earth must receive during the day more heat than it loses by radiation at night. The average annual intensity upon the whole earth's surface from pole to pole is 299 thermal days, the intensity of each of which units equals that of the mean equatorial day. The annual intensity of solar rays during 100,000 years, past or future, can never vary (owing to the varying eccentricity of the earth's orbit) more than the equivalent of five hours of average sunshine in a year. These conclusions refer to the whole earth's surface collectively. On the other hand, the annual intensity at the different latitudes on the earth varies much more considerably, and the extreme values of diurnal intensity may vary by as much as one ninth of the present value. It seems therefore that under the existing conditions of physical astronomy the intensity of solar heat upon the earth can never have been materially different from its present value.—In these rules we have considered only the heat received at the outer surface of the atmosphere from the sun, neglecting the absorption of heat by the earth's atmosphere and the radiation of heat back into space, two circumstances that materially affect actual temperatures. The absorption of heat in its passage through the atmosphere is directly found approximately by observations made with the pyrheliometer of Pouillet (Poggendorff's *Annalen*, xlv.), or the actinometer of Herschel (1825), which instruments replace the ruder contrivances of earlier days, such as Leslie's photometer (1797), and De Saussure's helio-thermometer (1787). The only self-recording apparatus that indicates the power of the direct rays of the sun at present in use is

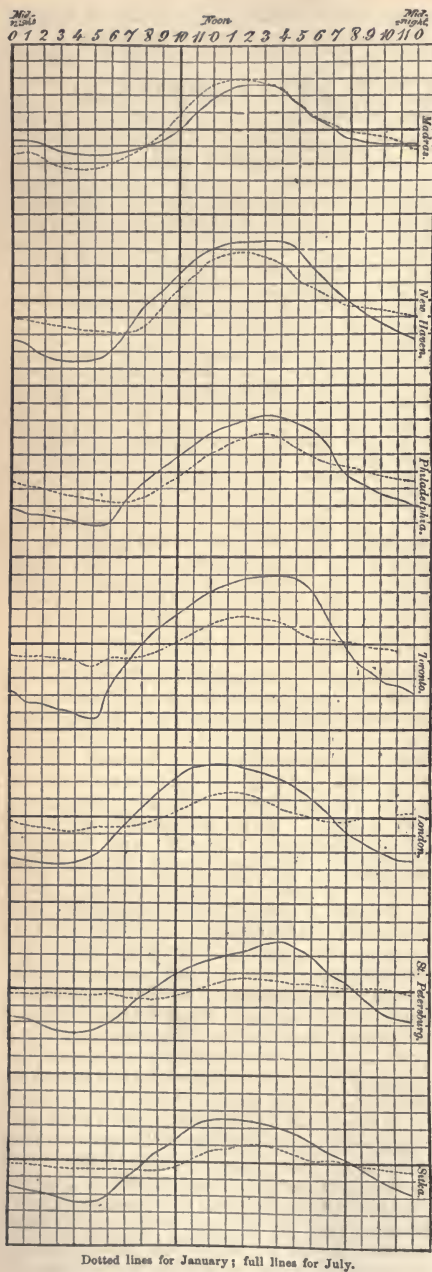
the so-called black-bulb-in-vacuum or solar-radiation thermometer of Negretti and Zambra. Observations with Pouillet's pyrheliometer show that the absorption of solar heat by the atmosphere follows sensibly the same law as the absorption of solar light, and amounts for the temperate zone to from 20 to 40 per cent. when the rays penetrate vertically downward. According to the investigations of Melloni, Tyndall, Magnus, and others, aqueous vapor is almost opaque to the invisible heat rays belonging to the red end of the spectrum, and accordingly an increase in the absorption of the direct solar rays occurs where an increased amount of moisture is present in the air. The absorption of solar heat by the material composing the earth's surface varies of course with every change in the constitution or molecular condition of the latter. Dry and sandy or rocky soils become heated to a higher temperature than the moister portions of the earth, while the ocean experiences the least variation of temperature. But perhaps the most important property of the earth's surface consists in this, that the rays which are not absorbed by it, and which are consequently radiated back through the atmosphere, have been degraded to the red end of the spectrum; these are therefore very largely absorbed by the aqueous vapor in the lowest portions of the atmosphere, from 40 to 90 per cent., according to the dryness of the air, being retained within one or two miles of the earth's surface. As a consequence of this absorption, the temperature of the air at the surface rises most rapidly during the day at places covered by a layer of clear moist air, even though such layer be at a considerable altitude above the station, without reaching down to it; and on the other hand, the temperature diminishes most rapidly at night when a clear atmosphere, holding but little moisture, exists over the station. The conduction and convection into the interior of the earth and ocean of the solar heat that falls upon its surface, produces such a storing up of heat as to sensibly ameliorate the sudden changes that would otherwise occur, and to delay the periodical daily and annual maxima and minima of atmospheric temperature. The temperature of the soil has been measured by means of thermometers whose bulbs are, as was first suggested by Quetelet, permanently imbedded therein; and the general laws governing the distribution of temperature in the interior of the earth were mathematically investigated by Fourier (1812) and Poisson (1835). The range of the variations of temperature diminishes rapidly as we descend into the soil, forming an inverse geometrical series when the depths form an arithmetical series; again, the durations of corresponding periodical changes in temperature at and below the surface of the ground increase at any depth in proportion to the square root of the durations of the surface periods. Daily variations of temperature are perceptible at a

depth of 3 ft., while annual variations are barely observable at a depth of 80 ft. The effect of the sun's heat upon the water of the ocean differs in some important respects from its effect on the continents: first, in that a large percentage of heat is rendered latent in evaporating the surface water of the ocean; secondly, in that the specific heat is much larger for water than for dry earth; and finally, in that the mobility of the water permits of a very extensive system of convection. According to the observations of Lenz (1829), Carpenter (1870), Thomson (1874), &c., the average temperature of the ocean at depths greater than 500 ft. is that of the maximum density of water at the pressure to which it is subjected. The temperature of a layer a few inches in thickness on the immediate surface of the water can, when the ocean is very still, be raised as high as 90° F.; but in the general disturbed condition of the water its surface temperature is much below that of the adjacent stratum of air. As a secondary effect of the influence of the ocean, must be noted the fact that the heat rendered latent in the evaporation of its surface water in great part returns to the atmosphere when that vapor is condensed to cloud and rain.—Having thus indicated the original sources of atmospheric temperature, we come to the consideration of that subject itself. In order that the temperatures measured in different portions of the world may be comparable among themselves, it is necessary that uniformity should be secured in the exposure of the thermometer to such influences as can affect its indications. As a general rule, in ascertaining the temperature of the lowest stratum of air, the thermometer should be elevated not less than 5 nor more than 50 ft. above the earth's surface, and should be surrounded on all sides, at a distance of from 1 to 5 ft., by a light double latticework, or equivalent structure, which can itself rapidly follow the varying temperature of the air, and prevent all radiation of heat except that which takes place between the thermometer and the interior of the latticework. But such a thermometer cage is scarcely practicable in the investigations of the temperature of the upper strata, so far as they can be reached by aeronauts, and numerous but unsatisfactory studies have been made into the relations between the indications of protected and unprotected thermometers. Some knowledge as to the temperature of the upper strata is given by the study of the refraction by the atmosphere of the rays of light which reach us from the celestial bodies. The most important features of atmospheric temperature are its variation with the altitude, its diurnal variation, its annual variation, and its geographical distribution. On the three latter points the mass of information can best be presented by graphic methods, as in the accompanying diagrams. But the irregularities of the temperatures at various altitudes may be better seen by the study of the following table:

Diminution of Temperature with increasing Altitude, as shown by Observations in Balloons.

ALTITUDE	Gay-Lussac and Biot.		Welch and Green.		Glaisher and Coxwell.					
	1804, Sept. 16	1852, Nov. 10	1862, July 17.		1862, Sept. 5.		1863, Sept. 18.			
Feet.	Asc.	Desc.	Asc.	Desc.	Asc.	Desc.	Asc.	Desc.		
0,000	57.4°	50.0°	59.0°	.....	59.5°	.....	61.0°	57.0°		
1,000	.....	46.2°	.....	.....	56.0°	.....	59.2°	.....		
2,000	.....	42.4°	.....	.....	.....	54.0°	57.0°	.....		
3,000	.....	38.7°	.....	.....	.....	53.5°	51.0°	.....		
4,000	.....	36.5°	45.0°	.....	45.0°	.....	48.2°	.....		
5,000	.....	35.8°	.....	.....	41.0°	49.2°	44.2°	.....		
6,000	.....	34.9°	35.8°	.....	36.5°	45.5°	40.1°	.....		
7,000	.....	34.0°	.....	.....	40.0°	41.0°	35.9°	.....		
8,000	.....	32.4°	32.5°	.....	.....	40.0°	.....	.....		
9,000	.....	31.1°	.....	.....	.....	.....	.....	.....		
10,000	54.4°	28.6°	36.0°	37.4°	32.0°	31.5°	32.0°	25.0°		
11,000	52.0°	25.5°	.....	.....	31.2°	31.0°	.....	21.0°		
12,000	47.5°	22.1°	26.0°	34.2°	.....	26.5°	31.0°	.....		
13,000	50.1°	17.8°	29.0°	.....	26.0°	24.5°	23.0°	.....		
14,000	48.8°	15.8°	.....	.....	.....	23.0°	21.0°	16.5°		
15,000	47.6°	14.2°	33.0°	.....	18.0°	.....	20.0°	17.0°		
16,000	43.8°	12.9°	31.0°	29.7°	16.5°	15.0°	17.5°	16.0°		
17,000	36.8°	9.7°	33.0°	.....	.....	.....	12.0°	.....		
18,000	36.9°	5.4°	.....	.....	15.0°	.....	.....	.....		
19,000	30.9°	2.8°	35.0°	.....	15.0°	.....	12.0°	.....		
20,000	29.2°	—1.8°	31.5°	.....	8.0°	17.0°	10.5°	.....		
21,000	23.8°	6.2°	24.5°	.....	11.0°	.....	13.0°	14.5°		
22,000	20.9°	9.2°	19.2°	28.0°	4.5°	11.0°	16.5°	.....		
23,000	14.5°	10.8°	.....	.....	.....	2.0°	12.5°	.....		
24,000	.....	.....	16.5°	37.0°	0.0°	.....	12.0°	12.0°		
25,000	.....	.....	16.0°	19.0°	—2.0°	.....	.....	.....		
26,000	.....	.....	16.0°	.....	5.0°	.....	.....	.....		
27,000	.....	.....	.....	.....	.....	.....	.....	.....		
37,000	.....	.....	.....	.....	11.9°	11.9°	.....	.....		

The decrease of temperature with increase of elevation has apparently a diurnal and an annual change, and 30 ascensions in 1868 showed that it may very probably often during the night be reversed into an increase instead of decrease, at least for the lowest 2,000 ft. Above the clouds the temperature decreases very steadily. As an average of all of his midday ascensions, Glaisher says that the diminution in the first 1,000 ft. was 4.5° with a cloudy sky, and 6.2° with a clear sky. In an ascent made on April 6, 1864, remarkable variations were met with, such that at 10,000 ft. the thermometer registered the same as on the earth's surface; but on this occasion clouds and fogs alternated up to the highest point attained by the balloon.—Diagram No. I. shows the diurnal variations of temperature for January and July, as deduced from observations continued through several years at stations in different geographical positions. In this table the average daily temperature of the month is assumed as the zero line. The annual variations for a few representative stations are shown graphically in diagram No. II., where even the minuter features of the yearly changes are developed by the use of Dove's five-day means. It will be noted that the maximum temperature occurs at Madras at the time of the solstice, while at stations further north it occurs two to five weeks later. Diagrams No. III. and IV. give the average distribution of mean temperatures over the surface of the earth as shown by means of the isothermal lines for January and July respectively, as published



Dotted lines for January; full lines for July.

DIAGRAM 1.—Diurnal Variation of Temperature.

by the British admiralty in 1872. These lines depend on the immense mass of observations collected by that board, and by the labors of Dove, Maury, Buchan, and many others. The

comparison of the isothermals for January and July shows at a glance the results of the combined influence of the solar altitude, the distribution of continents, plateaus, oceans, &c. The more detailed analysis and comparison of these temperatures belongs to the subject of climatology. So far as our observations extend, they show that the annual mean temperatures of the points having the same latitude are about $2\frac{1}{2}^{\circ}$ higher in the northern than in the southern hemisphere. The average temperature of the whole earth, according to Dove, is greater in July than in January by about 8° F., although in July the earth is further from the sun than in January, in the ratio of 93 to 90. Besides the preceding normal and periodical fluctuations of temperature, as deduced from the average of many observations, the temperature of the air is subject to large non-periodic variations, which disturbances, properly so called, are considered in connection with STORMS, under that title. The more important of these non-periodic variations accompany the areas of moist and dry air, as these successively flow over the earth's surface. These disturbances in the periodical variation of temperature have their origin in terrestrial influences, and are the secondary reaction of the sun's rays themselves.—3. *Winds and Currents.* If we neglect the slight amount of heat received from other sources, we may in general say that the winds are due to the combined influences of the rotation of the earth on its axis and the disturbances of the air, caused either by the introduction and subsequent condensation of its vapor, or simply by the warming of the lower strata of the atmosphere by the sun. The movement of the air is therefore a question of mechanics, capable of solution in just so far as mathematical analysis is able to fully take into account the combined influence of these primary forces, and the laws of pneumatics, friction, &c. This subject has been inductively investigated by Coffin, Buchan, Muhry, and Hann. The observations of the lower strata of the air are best obtained, as regards the directions of movement, by the self-recording wind vane, and as regards their velocity, by the self-recording anemometers. Apparatus by which these two anemometric elements are recorded continuously has in some form or other been adopted during the past few years by the government observers at a large number of stations throughout the world. The measurement of the pressure exerted against a flat surface by the wind is sometimes substituted for the direct measurement of the wind's velocity; but these two elements are only with difficulty and approximately to be compared between themselves. When observers have no means of measuring force or velocity, an empirical scale is adopted, two forms of which are in common use, that of Admiral Beaufort and that of the Smithsonian institution; these are given in the following table. Owing to the great differences in the estimates

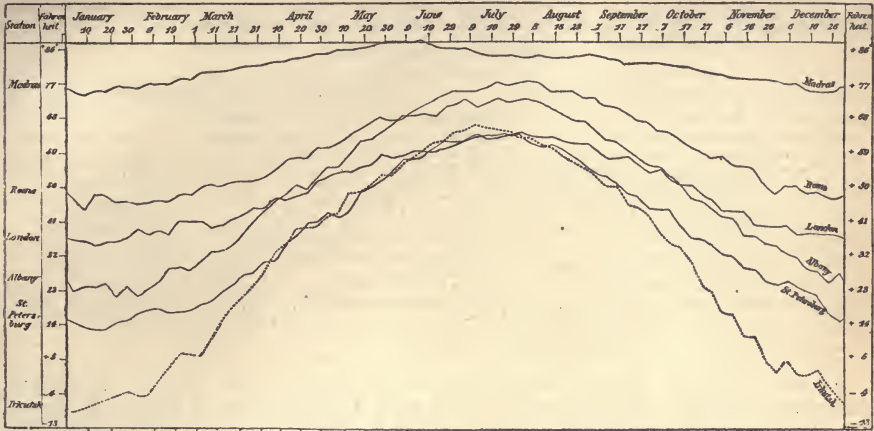


DIAGRAM II.—Annual Variations of Temperature

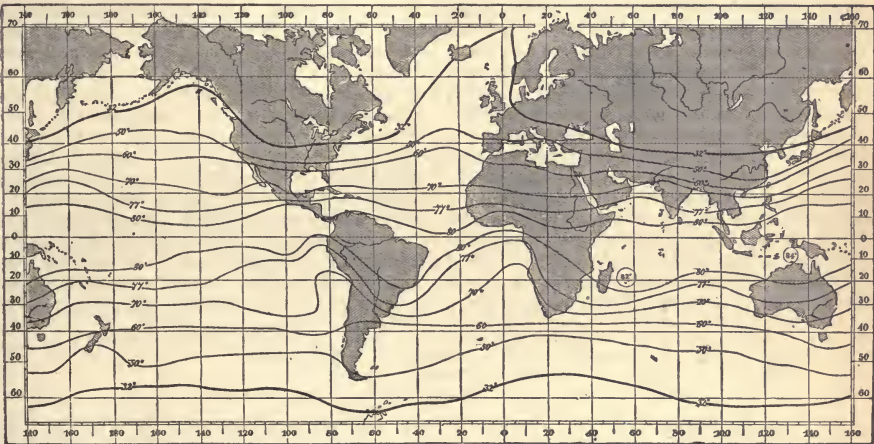


DIAGRAM III.—Isotherms or Lines of Equal Temperature for January.

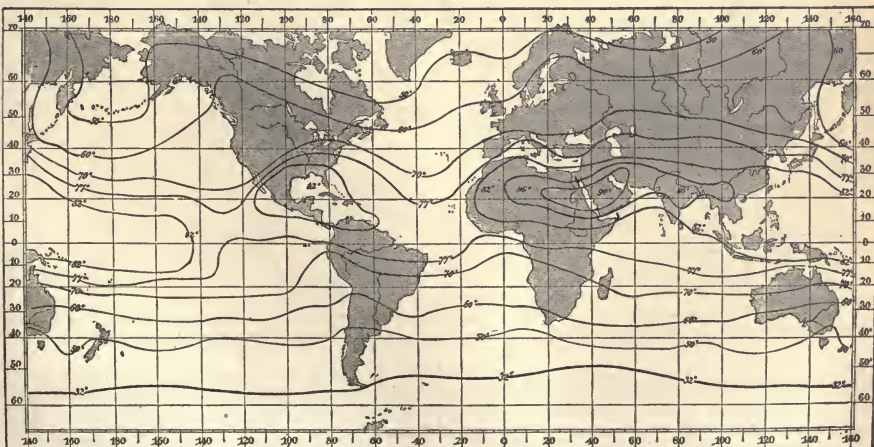


DIAGRAM IV.—Isotherms or Lines of Equal Temperature for July.

of wind force, it is difficult to convert these empirical scales into actual wind velocities, and they should be discarded whenever a good anemometer is available.

Empirical Scale of Winds.

BEAUFORT SCALE.			SMITHSONIAN SCALE.	
Number.	Designation.	Description.	Number.	Designation.
0.....	Calm.....	Just sufficient to make steerage way.	0.....	Calm.
1.....	Light air.....	With which a ship with all sails set would go in smooth water.....	1.....	Very light breeze.
2.....	Light breeze.....		2.....	Gentle breeze.
3.....	Gentle breeze.....		3.....	Fresh wind.
4.....	Moderate breeze.....		4.....	Strong wind.
5.....	Fresh breeze.....	In which she could just carry single reefs and topgallant sails.	5.....	High wind.
6.....	Strong breeze.....		6.....	Gale.
7.....	Moderate gale.....		7.....	Strong gale.
8.....	Fresh gale.....		8.....	Violent gale.
9.....	Strong gale.....	In which she could just bear close-reefed main-topsail, and reefed foresail.	9.....	Hurricane.
10.....	Whole gale.....		10.....	Most violent hurricane.
11.....	Storm.....	Under storm staysails or trysails.		
12.....	Hurricane.....	Under bare poles.		

The movements of the upper currents of the atmosphere have been observed by means of the clouds, balloons, the transfer of volcanic ashes, and the occasional luminous trains that are left in the wake of bright meteors. These latter, being from 10 to 100 m. above the earth's surface, have given us the only knowledge we have attained with respect to the currents at so great an elevation. With regard to the ascending and descending currents of air, no satisfactory method of observation has yet been put into execution, though such seems practicable by an *aéronaut*. So far as our present information justifies an opinion, it seems probable that at an altitude of above 10 m. the atmospheric currents are subject to variations as large, though perhaps not as sudden, as are the winds at the surface. In the lower portion of the atmosphere it is not

uncommon to find two or three currents of air, from as many different directions, superimposed upon each other. (See STORMS.)—The general phenomena of the winds at the surface of the earth may be considered in reference to their diurnal and annual variations, and their geographical distribution. The daily period in the strength and velocity of the wind is due in great part to the unequal heating of the different portions of the land, and especially to the over-heating of the land as compared with the sea. This period is most strikingly manifested at the stations on the immediate coasts of continents, and on the borders between mountainous countries and plains. In the latter case the elevated regions of the earth are cooled by nightly radiation, and the cold layers of dry air in contact therewith subsequently flow down and slip under the warmer

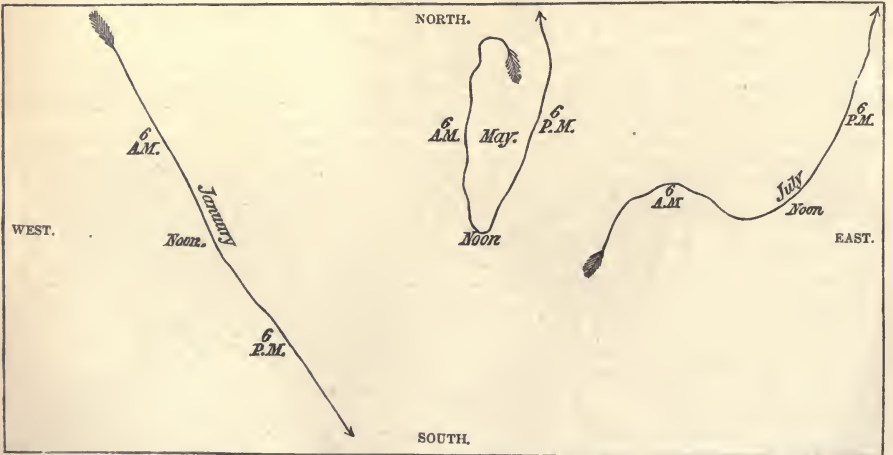


DIAGRAM V.—Diurnal Change in the Direction of the Wind at Wallingford, Conn.

and moister air of the lower lands. An excellent instance of the mutual influence of ocean and continents on the daily variations of the wind is shown in the accompanying diagram,

V., which gives the direction of the winds each hour of the day, for the months of January, May, and July, at Wallingford, near New Haven, Conn., as published by F. E. Loomis

in 1871. In this figure the arrows show the direction toward which the wind moves; the respective monthly lines show by the changes

the early morning winds are northerly (land breezes), while the evening winds are southerly (sea breezes). A daily period in the force with which the wind blows is as conspicuous as the periodicity in its direction. This is well exemplified in diagram VI., from Loomis, showing the average pressure of the wind in pounds per square foot for each hour, derived from the observations of Bache at Philadelphia.—The annual variations of the wind may be traced back to the same ultimate cause, namely, the varying influence of the unequally heated portions of the continents and oceans. The most remarkable annual variations in the winds are those known as monsoons, in the Indian ocean. The most remarkable permanent or nearly permanent winds are the trade

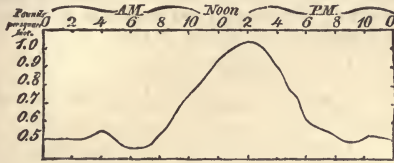


DIAGRAM VI.—Diurnal Variations in Force of Wind at Philadelphia.

in their directions, at every point from feather to barb, the changes of the wind from hour to hour. It will be seen, in fact, that in May

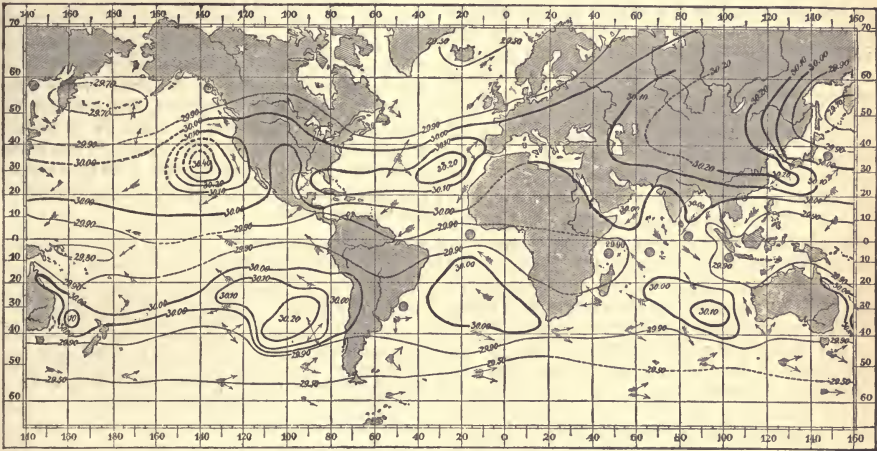


DIAGRAM VII.—Isobars and Prevailing Winds for January, February, and March

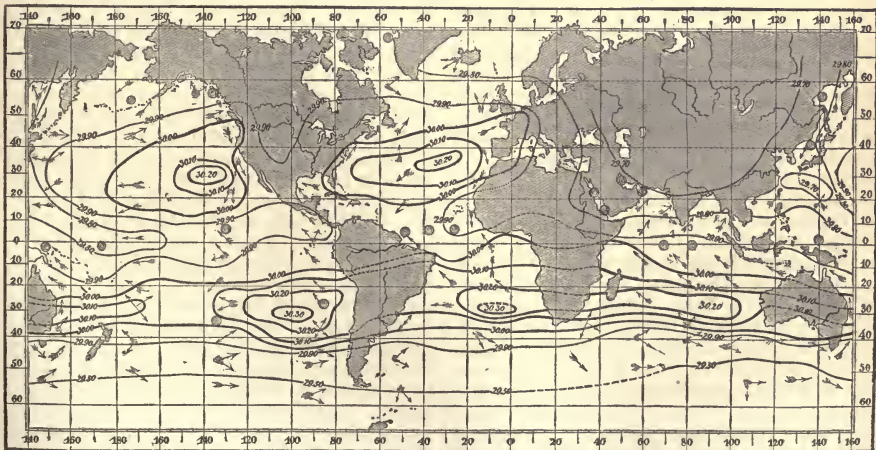


DIAGRAM VIII.—Isobars and Prevailing Winds for July, August, and September.

winds, which flow from the northeast and southeast, in the northern and southern hemispheres respectively, toward the equator, and include between them a narrow belt of equatorial calms. The latter has a breadth of a few degrees only, and varies its position with the seasons, lying somewhat further to the north of its mean position in July, and to the south in January. On account of the intimate relation between the direction of the wind and the barometric pressure, it is best to represent these two meteorological elements on one map; and accordingly on the accompanying charts, Nos. VII. and VIII. (compiled from those published by the British admiralty in 1872), are shown by arrows flying with the wind the prevailing winds for the months of July and January, over the entire globe; regions of prevailing calms are designated by shaded circles. The comparison of these charts will show more clearly than words the great changes which take place in the movements of the air during the year. The principal regions of calms and light variable winds, besides the equatorial belt already mentioned, are those belts about 10° broad, lying N. and S. of the trade wind regions, in the respective hemispheres. Coffin (1853) has moreover shown that N. of the belt of calms in the Atlantic the winds both of Europe and America show comparatively slight but decided indications of monsoon features, due to the over-heating of the land in summer and its cooling in winter. Similar phenomena are observed in reference to the Sahara of northern Africa, and to the continent of Australia. Of the non-periodic variations of wind, the most important are those attending storms. Dove has shown that, at any station in the northern temperate zone, the wind veers more frequently than it backs; that is to say, the successive wind changes are more frequently in the order S., W., N., &c., than they are in the reverse order, S., E., N., &c. But this interesting law may be considered as a simple consequence of the position of the stations in relation to the paths generally pursued by storm centres. Redfield (1821-'57) was the first to prove that in all extensive severe storms there is always present a system of surface winds revolving about and blowing in toward a storm centre, which latter has a progressive motion along the surface of the earth. At a short distance above the earth's surface is a system of outward-moving spiral currents immediately above the lower inward-moving winds. The independent investigations of Espy (1837), Reid, Piddington, Ley, and others, have abundantly confirmed the correctness of Redfield's conclusions; and the studies of later writers have shown that such a system of winds is characteristic of severe storms throughout the world. (See HURRICANE, and STORMS.) The relation between the wind and temperature is graphically represented by the thermal wind rose, which gives for each direction of the wind the average temperature re-

maining after eliminating the effects of the daily and annual changes and the lesser local peculiarities. The following table presents a few of the stations for which sufficiently long periods of observation are available to render the average results trustworthy:

Thermal Wind Rose.

WIND.	NEW HAVEN.	VIENNA.		LONDON.		ST. PETERSBURG.	
	Year.	Jan.	July.	Jan.	July.	Jan.	July.
N.....	46·3°	26·6°	66·8°	32·4°	61·0°	13·8°	58·6
N. E.....	43·4°	26·4°	70·2°	30·3°	61·6°	7·1°	62·7
E.....	49·5°	25·5°	74·3°	31·6°	65·0°	13·8°	64·7
S. E.....	50·2°	29·3°	71·8°	35·6°	66·8°	10·7°	65·5
S.....	52·2°	30·7°	72·5°	40·4°	65·4°	18·6°	65·4
S. W.....	53·0°	35·4°	72·5°	39·8°	63·7°	19·7°	64·9
W.....	47·9°	36·0°	65·9°	36·8°	63·6°	19·0°	61·6
N. W.....	44·5°	32·0°	66·0°	33·3°	62·0°	18·1°	60·2
N.....	46·3°	26·0°	66·8°	32·4°	61·0°	13·8°	58·6

The connection between the direction of the wind and the position of the moon in its orbit has been investigated by Schubler and Eisenlohr for stations in Germany, and the results, as shown in the following table by Schubler, would indicate that N. and E. winds are more frequent at the time of the last quarter of the moon, and that S. and W. winds prevail at the second octant:

Table showing the Prevalence of each Wind on the Days of the respective Phases of the Moon.

LUNAR PHASES.	Mean direction.							
	N.	N. E.	E.	E. S.	S.	S. W.	W.	N. W.
New moon.....	6	13	44	13	17	28	45	25
First quarter.....	8	12	40	17	17	24	55	24
Second octant.....	7	16	83	15	12	29	62	22
Full moon.....	11	15	85	16	12	35	59	28
Last quarter.....	12	29	41	10	13	35	38	16

—4. *The Aqueous Vapor*, whose presence in the atmosphere is of the highest importance in a meteorological point of view, as well as in reference to animal and vegetable life, may here be considered as having its ultimate origin in the ocean, whence it is drawn by surface evaporation under the influence of solar heat. Its subsequent diffusion throughout the atmosphere is in a slight degree due to Dalton's principle of the diffusion of gases, but principally to its convection by the winds; its deposition, whether in the form of clouds or rain, is the result of the subsequent cooling of the moist air. Of the rain which falls upon the land, a large portion is again evaporated, and thus returned to the atmosphere, and ultimately to the ocean. The quantity of moisture in the air is determined for meteorological purposes by means of observations with either the hair hygrometer of De Saussure, the wet and dry bulb thermometers of August, or the dew-point instruments of Daniell, Regnault, Bache, and others. (See HYGROMETRY.) Measurements of evaporation have such a peculiarly local significance that it has been difficult to ascertain any practicable means of making these comparable with each other; but it may be said

with considerable certainty that evaporation is two or three times greater in sunshine than in shade; is four or five times greater in hot summer days than in cold winter days; is greater

and on the other hand, by leaving the remaining air dryer, allows a more perfect radiation into space of the terrestrial heat, thereby increasing the diurnal variations of temperature. The diurnal variation in the expansive pressure exerted by the vapor is illustrated by diagram IX., showing the results of observations made at Vienna. The annual variation in vapor tension is given for the same station in the following diagram, No. X. By the relative humidity is meant the absolute humidity expressed as a fraction of the total quantity of moisture that the air would contain if perfectly saturated at its observed temperature. As to its diurnal variation, the relative humidity is least in the hottest portion of the afternoon, and greatest shortly before sunrise, as shown in diagram XI.; similarly, as to its annual variation, it is least in the summer months and greatest in the winter, as shown by comparing the curves for January and July in the same diagram, or more fully by the annual curve (R. H.) given in diagram X., where

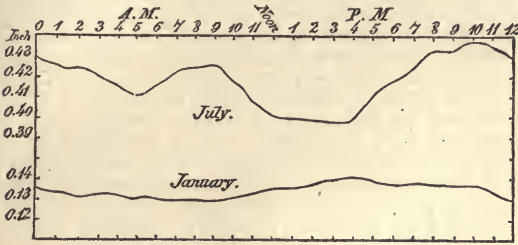


DIAGRAM IX.—Diurnal Change of Vapor Pressure.

in windy weather in proportion to the strength of the wind; is greater in dry than in moist weather; greater from marshes and forests than from fields of melting snow; greater from the latter than from the surface of the ocean; and in general greater in the equatorial than in the temperate regions. The aqueous vapor in the atmosphere may be considered from several points of view, namely: as to the pressure it exerts in maintaining barometric equilibrium; or as to its absolute quantity; or, again, as to its relative quantity as compared with the amount required to saturate the atmos-

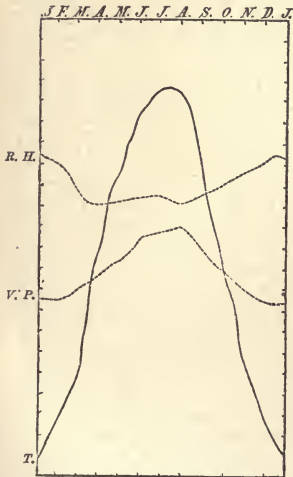


DIAGRAM X.—Annual Changes of Relative Humidity (R. H.), of Vapor Pressure (V. P.), and of Temperature (T.).

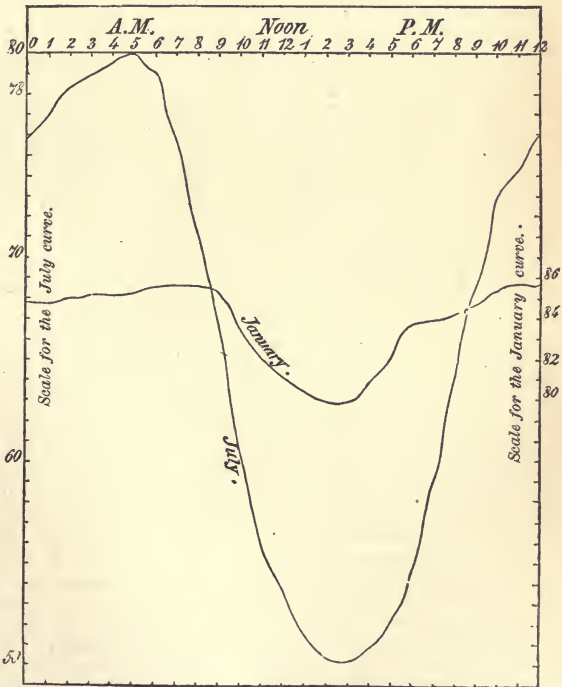


DIAGRAM XI.—Diurnal Change of Relative Humidity.

phere. The condensation of a portion of the vapor into cloud or rain, on the one hand, diminishes the barometric pressure, thereby giving rise to local areas of low barometer,

a comparison between the humidity and the temperature can be easily made. The irregularity of geographical distribution of moisture is by no means so great as might be expected.

It is true that in the interior of North America and of Asia the air at the surface is rarely if ever completely saturated; but on the other hand, the monthly and annual averages show that a very large amount of aqueous vapor is always present even in those regions, notwithstanding their comparative dryness. The distribution of moisture in reference to altitude above the sea was for a long time supposed to follow the law suggested by Dalton (1806), namely, that it was expanded throughout the atmosphere precisely as if constituting an independent vaporous atmosphere within the gaseous one; but the later researches of Regnault, Bessel, Strachey (1861), and Hann (1874) have shown the fallacy of this theory. According to Hann, the pressure diminishes as we ascend more rapidly than it should according to Dalton's law, and the weight of the vapor existing in a vertical column above a given place is only 0.22 of what his law would indicate; five tenths of the aqueous vapor is within 6,500 ft. of the surface of the sea, and the strata under 20,000 ft. in altitude contain nine tenths of the vapor in the entire atmosphere. The ratio between the quantity of vapor at a given height and that at the surface is shown in the following table, as deduced by Hann from balloon and mountain observations:

Altitude, feet.	Quantity of vapor.	Altitude, feet.	Quantity of vapor.
0	1.00	8,000	0.42
1,000	0.87	10,000	0.34
2,000	0.80	12,000	0.27
3,000	0.73	14,000	0.23
4,000	0.64	16,000	0.18
5,000	0.56	18,000	0.16
6,000	0.56	20,000	0.13
7,000	0.43	22,000	0.07

On the other hand, the irregularities of the distribution of vapor are such that the observations made in England in balloons show that layers of moist and dry air may alternate with each other. In the United States, and generally in continental situations, it is probable that such alternations only attend storms. The relation between moisture and the direction of the wind is expressed graphically by the so-called hygrometric wind rose, which gives for each direction of the wind the average force of vapor and relative humidity. The following table shows these relations for some of the few stations for which the computations have been made:

Hygrometric Wind Rose.

WIND.	FORCE OF VAPOR.		RELATIVE HUMIDITY.	
	London.		Halle.	
	Winter. in.	Summer. in.	Winter. per ct.	Summer. per ct.
N.....	0.21	0.42	89	68
N. E....	0.20	0.41	91	67
E.....	0.19	0.40	93	61
S. E....	0.27	0.54	86	66
S.....	0.32	0.60	83	67
S. W....	0.32	0.54	82	70
W.....	0.28	0.49	81	71
N. W....	0.24	0.44	88	69
N.....	0.21	0.42	89	68

The relative dampness of the easterly winds and the dryness of the westerly winds is well shown by this table for Europe. We also see that the fact that the summer winds are dryer than the winter is due to their increased temperature and capacity for vapor, and not to any diminution in the quantity of vapor held by them, since the latter is in summer larger than in winter.—5. *Precipitation of Aqueous Vapor.* This is apparent under the forms of cloud, fog, dew, and rain, and their various modifications, and produces a local diminution in the barometric pressure. The quantity of dew admits but very rarely of precise measurement, the most satisfactory series of experiments having been made by Dr. W. C. Wells in London. (For many details concerning it, see Dew, and Frost.) However important an abundant dew may be to the husbandman, it can scarcely be considered by the meteorologist as other than a local and temporary phenomenon, of minor importance in the general economy of the atmosphere. The formation of fog is but little more important in this connection. (See Fog.) Of more importance to all classes must be esteemed the formation of clouds and rain. (See CLOUDS, and RAIN.) Clouds, according to the commonly received classification of Howard (1802), are divided into the cirrus, stratus, cumulus, and nimbus, for which latter Poey (1872) has proposed to substitute the pallium or sheet cloud. Howard intended by the term nimbus to designate those clouds from which rain was falling; but it does not appear certain that rain may not occasionally fall from either the stratus, the cumulus, or the pallium, or from the numerous combinations of these typical forms. The presence of clouds and the phenomena displayed by them are valuable to the meteorological observer, both as affording him an indication of the direction of the upper currents of air, and as giving some clue to the moisture and temperature there prevailing. For the present we have principally to do only with the average percentage of cloudiness, and its influence upon the temperature. A diurnal periodicity, showing two maxima and two minima in the percentage of cloudy sky, will be perceived by the most cursory observer; the hours at which these occur vary with the kind of cloud; for the cumulus they are, maximum at 3 P. M., minimum at 5 A. M.; for the stratus, maximum at 6 A. M., minimum at 3 P. M. In mountainous countries it is easy to trace the direct dependence of this periodicity upon the heating of the soil during the day time and the cooling of the air by radiation during the night time; but the daily period is also distinctly pronounced within the tropics, and is clearly seen whenever a station in the temperate zone is in the interior of the continent within the range of an area of relatively dry air. The total percentage of all kinds of clouds is shown for two European stations in the following table for January and July:

Diurnal Variation in Cloudiness.

HOUR.	AT CRELFELD.		AT PRAGUE.	
	January.	July.	January.	July.
Midnight.	..	..	75 per ct.	49 per ct.
1 A. M.	..	..	73	45
2	..	..	..	..
3	..	..	65	46
4	..	..	74	51
5	..	..	..	..
6	82	63	76	49
7	..	..	74	54
8	77	62	..	..
9	..	..	73	58
10	76	66	..	..
11	..	..	73	56
Noon.	76	67	..	..
1 P. M.	..	..	73	57
2	74	66	..	..
3	..	..	73	54
4	73	63	..	..
5	..	..	73	54
6	69	59	..	..
7	..	..	75	54
8	67	53	..	..
9	..	..	73	48
10	70	53	..	..
11	..	..	75	51
Midnight.	..	..	..	..

An annual periodicity in the cloudiness is also observed (see the following table), having its maximum in the winter time throughout the temperate zones, while within the polar circle the maximum cloudiness may be placed in the late summer and fall.

Annual Variations in Cloudiness.

MONTH.	AT CRELFELD.	AT PRAGUE.
January.....	74 per ct.	73 per ct.
February.....	72	70
March.....	66	62
April.....	62	54
May.....	66	52
June.....	65	53
July.....	62	51
August.....	53	49
September.....	57	51
October.....	65	63
November.....	77	76
December.....	74	74

As regards the geographical distribution of cloudiness, it may be remarked briefly that the annual averages show a minimum cloudiness in the regions of the trade winds and in the interior of continents, and a maximum in mountainous districts, the polar regions, and on the western coasts of the continents. The relation between the direction of the wind and the average degree of cloudiness is known to all, and is rendered apparent by the following table:

Percentage of Cloudiness for each Wind Direction.

WINDS.	CARLSRUHE.		VIENNA.	
	Winter.	Summer.	Winter.	Summer.
N.....	63	46	75	45
N. E.....	56	32	74	26
E.....	56	29	63	25
S. E.....	69	43	71	25
S.....	80	59	70	37
S. W.....	82	62	69	43
W.....	80	58	65	56
N. W.....	77	55	72	55
N.....	63	46	75	45

The connection between the lunar phases and the cloudiness has been already spoken of. The influence of cloudiness in protecting the earth's surface against the direct rays of the sun, and against nightly radiation from the earth, has been investigated for a few stations only. According to Weilenmann (1874), the atmosphere, when the sky is clear, protects the earth against radiation by an amount equal to one third of the protection afforded by a cloudy sky, whence the latter may be concluded to allow on the average scarcely 15 per cent. of the solar heat to reach the earth's surface. The connection between cloudiness and barometric pressure has not yet been studied with the care it deserves; but it is certain that a low barometer corresponds to an increased cloudiness, and an important portion of the daily variation in the barometric pressure depends upon the formation of dew or fog at night and of cumulus clouds by day. The rainfall may be considered as the completion of the process of the formation of clouds, although probably the majority of clouds are dissipated without producing rain. The larger part of the rainfall is probably deposited by uprising currents of air, and therefore it has its daily and annual periods. The formation of snow is apparently more directly dependent upon nocturnal radiation of heat. The measurement of rainfall by means of the simple rain gauge needs to be made under circumstances of great uniformity, if for different stations we would attain results comparable with each other. The most minute investigations of the laws governing rainfall have been made by Symons, and published since 1866, in his annual volumes of "British Rainfall." According to these results, which are abundantly confirmed by other measures taken throughout the world, the quantity of rain received by a gauge diminishes in an irregular manner with the height of the gauge above the earth's surface. The diminution is apparently to be attributed principally to the greater velocity of the wind at the higher station, and amounts to 10 per cent. of the whole rainfall for an elevation of 20 ft., and in one exceptional case, at the height of 50 ft., to 40 per cent. of the rainfall at the surface. The study of the diurnal period of the precipitation (including rain and snow) has as yet led to only an imperfect result; but it is believed that as a general rule, in the temperate zones, a maximum occurs in the afternoon in the summer, but before sunrise in the winter months. The annual variation in rainfall depends almost exclusively upon the relation between the winds and the geographical position and topographical details of the country. On the W. coast of North America and of Europe the greater part of the annual rainfall occurs in winter, but in the interior of Europe and on the E. coast of the United States in summer. The geographical distribution of the snow and rainfall over the world can be properly presented only by means of a very large and detailed chart; its

general distribution over the United States is shown by the accompanying map (XII.), compiled by Schott for the Smithsonian institution, from all the data available in 1872. The heaviest rainfall occurs in those countries in which warm moist monsoon winds blow from the seacoast up over rapidly rising hills. Thus the annual rainfall on the Cossyah hills, facing the bay of Bengal, is 600 inches, but 20 m. further inland it is reduced to 200 inches, and at 30 m. to 100. The connection between rainfall and the direction of the wind presents therefore an apparent discrepancy in various parts of the world, even for stations on the same parallel of latitude, according as the winds ascend in their course from the ocean level to hilltops, or descend from the mountains and plateaus to the lowlands. The percentage of rainy and not rainy winds is given for London in the following table, which shows that 69 per cent. of the days when S. W. winds prevail are rainy, while only 33 per cent. of the E. and N. E. winds bring snow or rain :

Relation between Rainy Days and the Direction of the Wind at London.

WIND.	Total number of observations.	Total number of rainy winds.	Percentage of rainy winds.
S. W.	1,965	1,321	69
W.	982	476	51
N. W.	1,816	754	41
N.	580	191	33
N. E.	1,194	379	33
E.	659	250	38
S. E.	723	337	47
S.	376	256	68
Variable ..	441	217	49
Calm.	94	0	0

For the United States this relation may be presented in another form. Out of 100 cases of rain or snow the average number occurring with the different winds is as follows :

Percentage of Wind on Rainy Days.

WIND.	New Haven.	Cincinnati.	WIND.	New Haven.	Cincinnati.
N.	8	2	S. W.	15	25
N. E.	37	10	W.	1	18
E.	6	1	N. W.	7	25
S. E.	19	9	N.	8	2
S.	7	10			

On the other hand, we have very few analyses of automatic records showing the relation between the quantity of rain and the direction of the wind. The following example for Lisbon will illustrate this connection :

Average annual Quantity of Rainfall for each Direction of the Wind at Lisbon.

WIND.	Rainfall, inches.	WIND.	Rainfall, inches.
N.	0.51	S.	3.39
N. N. E.	0.71	S. S. W.	5.04
N. E.	0.39	S. W.	4.84
E. N. E.	0.32	W. S. W.	5.79
E.	0.45	W.	2.05
E. S. E.	1.54	W. N. W.	1.18
S. E.	1.30	N. W.	1.10
S. S. E.	1.65	N. N. W.	0.55
S.	3.39	N.	0.51

—6. *Barometric Pressure.* It is only when we come to study the pressure of the atmosphere, as shown by the barometer, that we arrive at a connected intelligible view of the peculiarities of weather and climate. In fact it is evident that no portion of the atmosphere can be moved from one region to another, except under the influence of a pressure applied in the direction of its motion; such movement is simply an effort to reestablish a disturbed statical equilibrium. The laws of mechanics show that relatively to the earth's surface the air would remain quiescent if the sun were absent; but the density of the atmosphere is disturbed by the solar heat, by the variable quantity of aqueous vapor rising from the oceans and continents, and by the local condensation of this vapor into cloud and rain. In this way temporary abnormal inequalities in the distribution of barometric pressure are produced, which give rise to the winds, and afford the meteorologist that connecting link which enables him to unite the whole circle of atmospheric phenomena into a harmonious system. (See BAROMETER.) The height of the barometric column is found to vary at the same station in regular diurnal and annual changes, and also in a non-periodic manner; on moving the instrument to other places, its height is found to vary with the geographical position, and in an especially remarkable degree with every change of altitude. The latter class of changes have been the subject of numerous profound investigations, having for their ultimate object both the utilization of the barometer for hypsometric purposes, and the solution of the inverse problem, the reduction of actual barometric readings to the sea level. The solutions of both these problems can as yet be satisfactorily effected only in respect to annual means; but within allowable limits of error approximate methods may be applied to monthly means and

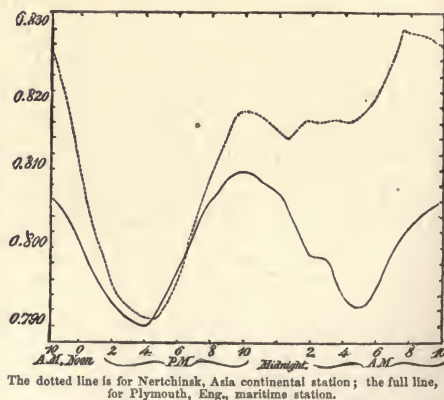


DIAGRAM XIII.—Diurnal Variations in the Barometer.

to individual observations, when the altitude of the station does not exceed 2,000 ft. The

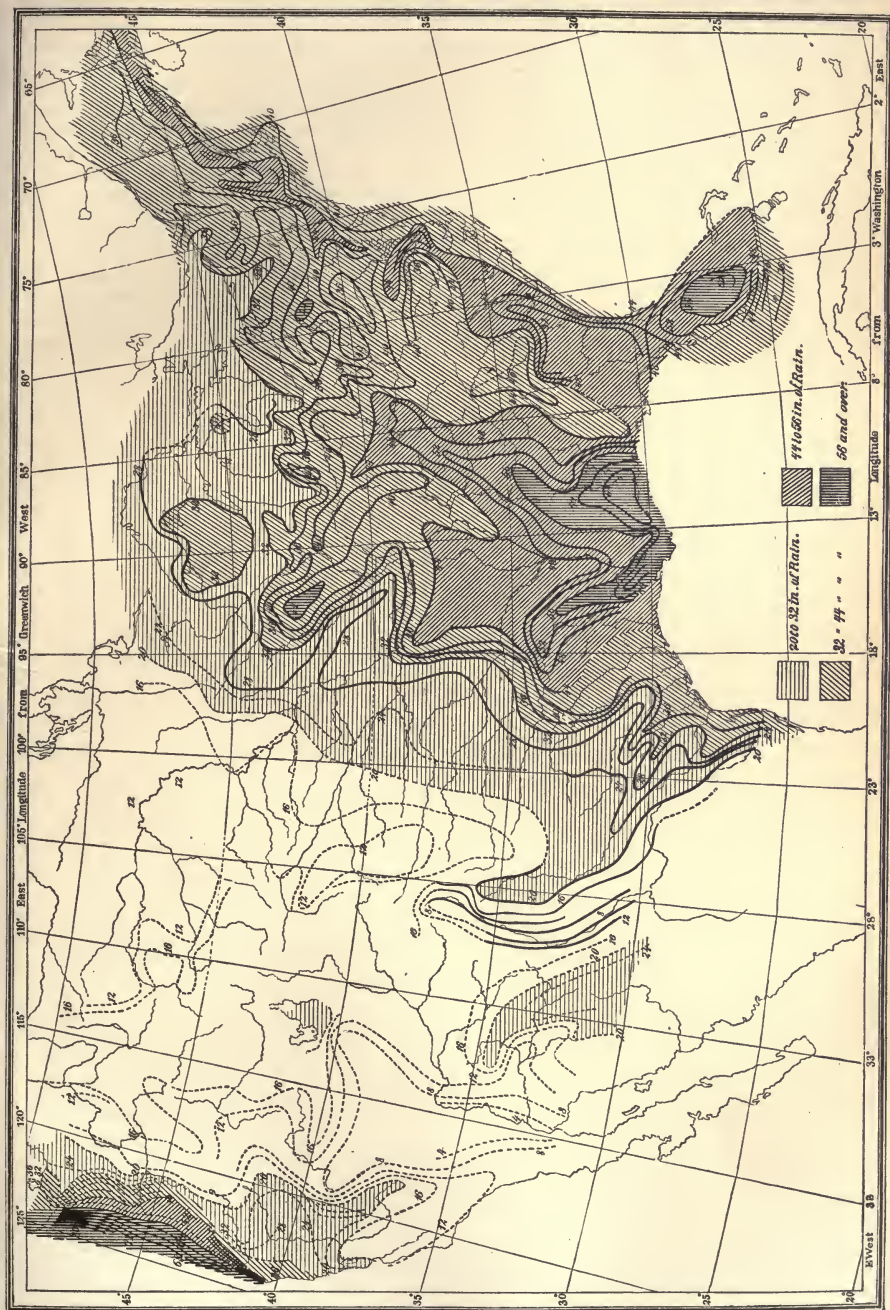
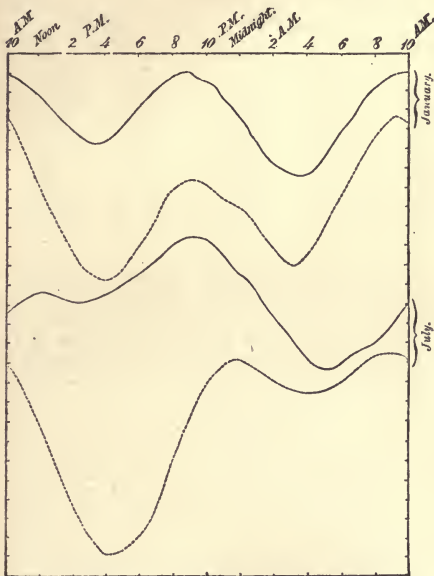


DIAGRAM XII.—Rain Chart of the United States, showing by Lines the Distribution of the Mean Precipitation in Rain and Melted Snow for the Year.

systematic variations in the barometric pressure can be best shown graphically, and it will suffice to present only a few typical cases. The existence of a perceptible lunar tide in the atmosphere is now no longer considered probable, and the important periodic changes all depend upon the sun. The diurnal changes, as shown in diagram XIII. for Nertchinsk, Siberia, and Plymouth, England, illustrate respectively the continental and maritime stations. The effect of elevation above the surrounding country (not merely above sea level) is seen in the contrasts between the diurnal changes at Geneva (altitude 1,335 ft.) and at the summit of Mt. St. Bernard (8,114 ft.), as shown in diagram XIV., both for January and July. At the sea level, two maxima and two minima of pressure occur during each 24 hours; the maxima be-

the combination of these that produces the irregular and even double fluctuations in the total pressure shown in the preceding diagrams. A general view of the annual barometric changes, and a more complete insight into the relation between pressure, wind, and weath-



The full lines are for St. Bernard; dotted lines for Geneva.
 DIAGRAM XIV.—Diurnal Variations in the Barometer.

tween 9 and 11 A. M. and between 9 and 11 P. M., the minima between 3 and 5 P. M. and between 2 and 5 A. M., respectively. The annual barometric changes are shown in diagram XV. as given by Lorenz and Rothe (1874) for typical stations, whence the great influence of geographical position is easily seen. A clearer perception of the important part played by aqueous vapor will be obtained if from the whole atmospheric pressure shown in diagrams XIII., XIV., and XV. we subtract that portion due to aqueous vapor, as shown in diagrams IX. and X.; the remainder is technically known as the pressure of the dry air, or the gaseous atmosphere. It is found that the gaseous and the vaporous components have each a single diurnal and annual fluctuation, and that it is

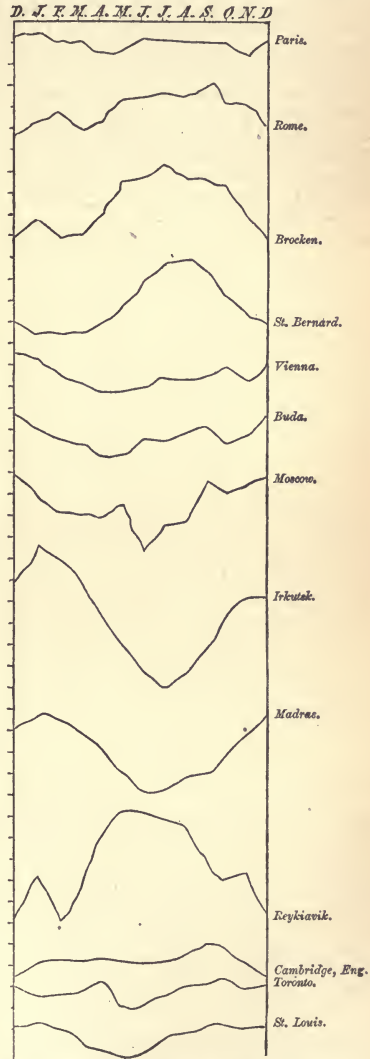


DIAGRAM XV.—Annual Variations in Atmospheric Pressure.

er, are obtained by the comparison of a series of charts, such as VII. and VIII., which show for the respective months the average distribution of the pressure of the atmosphere over the surface of the globe. The variations of barometric pressure with the latitude were first defi-

nity established by Schouw (1832), although asserted by Clark (1776) and Humboldt (1807). The variations which occur on the same parallel of latitude, and especially the seasonal differences between the pressures over the land and the ocean, were first elaborated by Buchan (1868). The charts VII. and VIII. are compiled from the latest results published by Buchan and by the admiralty office in London, and must be considered as representing very nearly the actual distribution of barometric pressure over the globe, as reduced to a uniform sea level. The irregular or non-periodic variations of the pressure are intimately connected with the disturbances or storms which sweep over the earth. (See HURRICANE, and STORMS.) The regions of greatest average

irregular barometric variations coincide in general with the regions of most decided alternations between clear, cold, dry weather, and cloudy, warm, moist, or rainy weather. In analyzing this connection between pressure and weather, we will only mention the relation between the barometer and the winds and rain. The general connection between the changes of pressure at any place and the winds is shown in the following table, which gives the average reading of the barometer during the prevalence of the respective winds for a few typical stations in the northern hemisphere; in these cases, as for the entire globe, the pressure is greatest for cold or dry winds, and least for warm or moist winds, which law obtains in both the winter and summer seasons:

Relation between the Wind Direction and the Barometric Pressure.

WIND DIRECTION.	ST. PETERSBURG.		LONDON.		CARLSRUHE.		VIENNA.	
	Winter.	Summer.	Winter.	Summer.	Winter.	Summer.	Winter.	Summer.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
N.....	29.111	28.023	29.974	29.997	29.781	29.782	29.493	29.866
N. E.....	28.183	28.086	29.972	30.040	29.786	29.781	29.455	29.861
E.....	28.290	28.065	29.885	30.057	29.721	29.695	29.466	29.250
S. E.....	28.311	28.028	29.746	29.983	29.698	29.626	29.412	29.259
S.....	28.189	27.982	29.724	29.852	29.644	29.626	29.381	29.238
S. W.....	28.129	28.008	29.849	29.799	29.687	29.622	29.171	29.242
W.....	28.055	28.089	29.962	29.862	29.651	29.642	29.272	29.284
N. W.....	27.944	28.086	29.977	29.946	29.708	29.708	29.862	29.266
N.....	28.111	28.023	29.974	29.997	29.781	29.782	29.493	29.866

The relation between atmospheric pressure and rainfall depends upon the direction of the accompanying wind; but if, as in the following table, each wind direction be treated by itself, it will be seen that during rain and snow the pressure is usually below the average for that wind, and is falling still lower for southerly winds and increasing rain, but is rising for northerly winds and clearing weather:

Barometric Variations preceding and following Rain.

WIND.	Depression of barometer below the general average for the respective winds at Berlin.		Change in the barometer at Stockholm during the twenty-four hours.	
	During rain.		Preceding rain.	
	Inch.	Inch.	Inch.	Inch.
N.....	0.143	0.242	+0.037	+0.053
N. E.....	0.144	0.263	+0.005	+0.039
E.....	0.118	0.226	-0.001	-0.036
S. E.....	0.109	0.208	-0.044	-0.058
S.....	0.109	0.202	-0.036	-0.054
S. W.....	0.087	0.174	-0.063	-0.023
W.....	0.069	0.189	+0.012	+0.020
N. W.....	0.109	0.169	+0.027	+0.094
N.....	0.143	0.242	+0.037	+0.1015

The connection between the temperature, pressure, wind, and weather may be briefly indicated in the so-called weather rose, examples of which are presented for central Europe and for a portion of the United States in diagrams XVI. and XVII.—We here terminate our presentation of some of the more interesting relations between those meteorological phenomena which admit of exact observation, and which form a safe basis for further philosophical investi-

gations.—DEDUCTIVE METEOROLOGY. Of meteorology as an inductive science, the preceding pages and the various articles referred to therein may serve to give us some faint idea; of it as a deductive science it would seem premature as yet to speak, were it not that the foundations



DIAGRAM XVI.—Weather Rose for Central Europe.

of this new meteorology are now apparently well laid, although it must be confessed that the passage from crude observations back to the unknown laws of the invisible forces which guide these most complex operations of nature is not yet completely open to the student. The

attempts to predict the weather, and especially storms, which are now daily made by the meteorological offices of numerous civilized nations would of themselves seem to imply the existence of a deductive science more or less developed. This however is not necessarily the

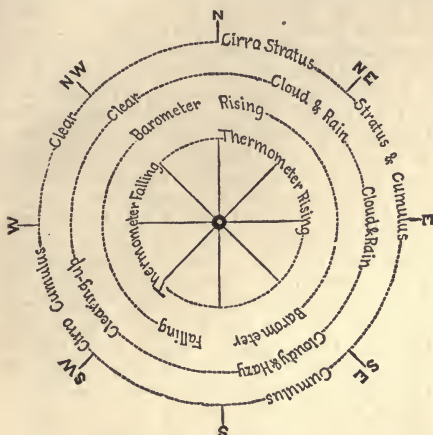


DIAGRAM XVII.—Weather Rose for Eastern and Middle United States.

case, for it has been found practicable, on the one hand, by means of the telegraph, to collect in a few hours material for compiling a daily weather map for the whole of Europe or the United States, and, on the other hand, to apply to such maps the numerous generalizations that have been found to hold good for the respective portions of the world; a process which, repeated from day to day, reminds one of the methods adopted in astronomy for computing special perturbations. There seems to be no good reason for speaking disparagingly of meteorology as a science, since, whether we study the stars, the atmosphere, atoms, or organic nature, we find ourselves everywhere confronted by an overwhelming mass of phenomena which are subject as yet only to an inductive philosophy. Owing to the infinite number of combinations among the meteorological elements, no empirical rules can invariably lead to correct predictions; but the calculus of probabilities shows that over 50, and often 75 per cent. of our predictions should be well verified, a conclusion in harmony with actual experience throughout the world. But this percentage of verifications, we have reason to believe, is sensibly greater when the predictions are based not merely upon empirical rules, but equally upon a consideration of such general principles as must form the groundwork of the true deductive science. The foundations of the new meteorology are necessarily found in the simple laws of mechanics. They have been considered by several authors, but by none with so much completeness as in the work of Ferrel

"On the Motions of Fluids and Solids, relative to the Earth's Surface" (Nashville, 1854, and New York, 1860). In this treatise the motions and figure of the atmosphere are first treated of, on the hypothesis that no resistance is offered by obstacles or by friction upon the earth's surface; in a subsequent section the influence of such resistance is considered, on the hypothesis that a uniform coefficient of friction obtains over the whole earth's surface. Mr. Ferrel thus deduces the necessary existence of two belts of high barometric pressure, extending entirely around the globe between the tropics and the parallels of 30° N. and S. respectively, and of a belt of low pressure at the equator, as well as regions of low barometer within the arctic and antarctic circles; belts of calms near the equator, the tropics, and the polar circles are also deduced. The continents and oceans offer very unequal frictional resistances, which causes the equatorial belt of calms to lie on the average a little north of the true equator in the Atlantic and Indian oceans, but nearly on the equator in the Pacific ocean. Similarly, it can be shown that to the irregular distribution of the friction of the continents is partially due the breaking up of all these belts into segments lying respectively over the ocean and the continents. In general the motion of the earth's atmosphere is a consequence of the unequal heating by the sun of the equatorial and polar regions; the subsequent effort of nature to establish statical equilibrium relative to the earth's surface is that which gives rise to the phenomena of the winds. The unequal heating of the continents and oceans, due to their unequal specific heats and radiating power, and to the annual vibration of the sun between the tropics, is the principal cause of the breaking up of the belts of temperature, pressure, and winds into continental and oceanic areas. But whatever induces a local or general change in the density of the air disturbs its equilibrium and necessitates its motion; and the disturbing power next in importance to the solar heat is the diffusion of aqueous vapor, the density of which is only six tenths of that of dry air at the same pressure and temperature. It thus happens that the combined effect of friction, temperature, and moisture gives rise to the variable distribution of barometric pressure exhibited in the charts VII. and VIII., which show areas of high barometer existing in winter over the continents, but in summer over the oceans, and over the eastern half of each ocean, rather than over its central portions. The general distribution of barometric pressure having been thus deduced by Mr. Ferrel, he then considers the local disturbances known as cyclones, tornadoes, &c., all the phenomena of which are deducible from his initial mechanical formulas (see "Bulletin of the Philosophical Society of Washington," June, 1874, and the "American Journal of Science," November, 1874), if we supplement these by the researches of Hirn, Peslin, and Reye.

These latter have applied to the phenomena of the atmosphere, and especially to its vertical motions, those laws of thermodynamics which were first fully insisted on by Espy in "The Philosophy of Storms" (1841), but which required the accurate experiments of Regnault and the analysis of Clausius, Thomson, and others, to make them available quantitatively, as well as qualitatively, for meteorological purposes. The above mentioned authors have shown the connection that must exist between the expansion of uprising moist air (whether it be pushed by winds up over elevated regions, or ascend on a hot day in consequence of local rarefaction), and the formation of clouds and rain, deducing thereby, with great minuteness, many of the details of the origin, growth, path, and decay of storms. Finally, the phenomena of radiation and absorption of heat, though as yet only partially deducible from correct physical theories of the constitution of gases, may still be looked upon as well determined experimentally by the observations of Tyndall and others, as far as regards the constituents of the atmosphere, and form the basis of the reasoning by which we are able to deduce the general laws of the periodic and non-periodic changes of temperature and moisture. We are thus in a position to reduce all meteorological phenomena to the three principles involved in general mechanics, thermodynamics, and molecular physics; and it may be confidently expected that the increasing powers of mathematical analysis will ere long enable us to rear upon these a superstructure of deductive meteorology, whose application to the explanation and even the prediction of the weather will be limited only by the extent and accuracy of our observations.

METER. See GAS, vol. vii., p. 638, and WATER METER.

METHODISM, a form of church life and polity which originated in England during the 18th century. I. **EARLY HISTORY AND PRINCIPLES.** The moral and religious condition of England at the beginning of the 18th century was most deplorable. The court was dissolute; the standard of taste was low; the prevalence of skepticism was alarming; the church, both established and dissenting, had lapsed into a state of lifeless formalism; the masses of the people had sunk into incredible vice and brutality. In the year 1729 John Wesley, a fellow of Lincoln college, Oxford, became convinced of the necessity of a deeper spiritual life. With his brother Charles, likewise a student of Oxford, and a few other associates, he organized a meeting for their mutual moral improvement. The band soon began to manifest increased religious zeal by visiting almshouses and prisons, by instructing the children of the poor, and by a strict and conscientious observance of all the ordinances of the church. They were soon joined by others, among them Mr. Hervey and Mr. George Whitefield of Pembroke college, till at the end of six years they

numbered 14 or 15 persons. The rigid exactness of their lives attracted general attention among their fellows; they were objects of ridicule and contempt, and received various designations, but the term "Methodists" was applied to them by a student of Christchurch college, on account of their methodical mode of life and work. On the departure of the brothers Wesley to Georgia in 1735, the band was dissolved, but the new religious life that had there been enkindled manifested itself in the more zealous ministrations of the members of the "Godly Club." After his return, Wesley began to preach in London and elsewhere with great fervor. His sole object was to bring back the church to a pure and holy life, and to save the degraded and neglected. For the same object Whitefield and others had already labored earnestly during the absence of the Wesleys in Georgia. These reformers were at first received with coldness by the public, and their labors were regarded with suspicion or hostility. Wesley was at length debarred admission to the pulpits. In the early part of 1739 Whitefield had set the first example of open-air preaching at Kingswood, near Bristol, where he had addressed an immense crowd of colliers. Though at first disapproving of Whitefield's attempt, after a brief hesitation John Wesley as well as his brother Charles followed this example. Being denied admission to the churches by the clergy, they were compelled to continue their preaching in private houses, barns, market places, and the open fields, as opportunity was given. Thousands flocked to their ministry, and multitudes were converted. Wesley and his coadjutors were stubbornly opposed by the dignitaries of the establishment, who were strong in condemnation of this violation of ecclesiastical order. Sometimes the mob was stirred up to revile and assault them; sometimes the power of the law was invoked against them as disturbers of the peace. The converts made by their preaching were either despised or utterly neglected by the church, and hence Wesley, at their own request, formed them into societies for mutual edification and improvement, called "the United Societies." Wesley's own account of their origin is as follows: "In the latter end of the year 1739 eight or ten persons came to me in London, who appeared to be deeply convinced of sin, and earnestly groaning for redemption. They desired (as did some two or three more the next day) that I would spend some time with them in prayer, and advise them how to flee from the wrath to come, which they saw continually hanging over their heads. That we might have more time for this great work, I appointed a day when they might all come together; which from thenceforward they did every week, viz., on Thursday in the evening. To these, and as many as desired to join with them (for their number increased daily), I gave those advices from time to time as I judged most needful for them;

and we always concluded our meetings with prayer suitable to their several necessities. This was the rise of the united society, first in London, and then in other places. Such a society is no other than a company of men having the form and seeking the power of godliness, united in order to pray together, to receive the word of exhortation, and to watch over one another in love, that they may help each other to work out their salvation." The mass of those who had been converted were from the poor and uneducated classes. For the government of these societies a few simple rules were proposed by the Wesleys, which, with slight exceptions, are still recognized as the "General Rules" by all branches of the Methodist church. The sole condition of membership in these societies was "a desire to flee from the wrath to come and to be saved from sin." But this desire will be shown by its fruits, leading the man to avoid evil and to do good. Hence these rules forbade in the members of these societies the evils then most generally practised, "such as profane swearing, Sabbath breaking, drunkenness, buying or selling spirituous liquors, or drinking them except in cases of extreme necessity; fighting, quarrelling, brother going to law with brother, returning evil for evil or railing for railing; the using of many words in buying and selling; the buying or selling of uncustomed goods; the giving or taking things on usury, *i. e.*, unlawful interest; uncharitable or unprofitable conversation, particularly speaking evil of magistrates or of ministers; doing to others as we would not they should do unto us; doing what we know is not for the glory of God, as the putting on of gold and costly apparel; the taking of such diversions as cannot be used in the name of the Lord Jesus; the singing those songs or reading those books which do not tend to the knowledge or love of God; softness, and needless self-indulgence; laying up treasures upon earth; borrowing without probability of paying, or taking up goods without probability of paying for them." But it was "expected that all continuing in these societies should continue to evidence their desire of salvation, secondly, by doing good; by being in every kind merciful after their power; as they have opportunity, doing good of every possible sort, and as far as possible to all men; by feeding the hungry and clothing the naked; by helping or visiting them that are sick or in prison; by instructing, reproofing, and exhorting; by doing good especially to them that are of the household of faith, or groaning to be so; employing them preferably to others, buying one of another, helping each other in business, &c., and so much the more because the world will love its own, and them only; by diligence and frugality; by self-denial and by submission to bear the reproach of Christ; by attendance upon the ordinances of God, such as public worship, the ministry of the word, the supper of the Lord, family and private prayer, searching the Scriptures, and fasting and abstinence."

These rules were declared to be taught in God's Word, and that they are written on every truly awakened heart. If any violate these rules, they are to be admonished and borne with for a season; but if they persist, then they are to be excommunicated. For the accommodation of these societies chapels had been provided at London and Bristol. During 1740-'41 Wesley and his co-workers were preaching and founding societies in Yorkshire, Derbyshire, Leicestershire, and Wales, while Whitefield had made his second voyage to America, and by his wonderful eloquence had aroused the religious consciousness of the people from Maine to Georgia. On the return of Whitefield the differences between him and Wesley on doctrinal points caused their separation, and Whitefield organized the Calvinistic Methodists in 1741. By the labors of Whitefield, Methodism was introduced into Scotland and Wales, and, aided by the munificence of the countess of Huntingdon, chapels were provided and a college for preachers was founded. Calvinistic Methodism had many remarkable adherents, who were instrumental in the conversion of multitudes. Next to Whitefield in labors and success was Howell Harris, the apostle of Methodism in Wales; and not less in labors were Romaine, Madan, Venn, Berdridge, and others. In 1744 Whitefield made his third voyage to America, repeating the labors of former visits, and preaching with wonderful effect in the Bermudas in 1748. On his return to Europe in June, 1748, he visited Scotland, and also preached to immense congregations in England. In 1747 Thomas Williams, a lay preacher from England, had formed a society in Dublin. In the same year the Wesleys visited Ireland, and great success attended their ministry, though bitter opposition was experienced from the Roman Catholic population. Among the converts from Catholicism in 1749 was Thomas Walsh, who has been styled the apostle of Methodism to the Irish. In 1744 Wesley had invited several clergymen of the establishment and his lay assistants to meet him in London, to give "their advice respecting the best method of carrying on the work of God." Thereafter these "conferences" were held annually, and were occasions of revising the work, laying plans for the ensuing year, and discussing questions of doctrine and polity. In the midst of his severe labors Wesley wrote in defence of the system which he had inaugurated, and devised means for the education of his preachers and the improvement of his churches. In 1757 he was joined by John Fletcher, a Swiss by birth, who had been ordained a priest in the established church. In him Wesley found an earnest defender and a powerful apologist for his doctrinal views. During the progress of this wonderful revival work, the strong opposition of the clergy of the establishment continued. Individual examples of sympathy and aid to the itinerants were found, but in many in-

stances the converts, and even Mr. Wesley and some of his clerical fellow workers, were repelled from the eucharist. Under these circumstances it was felt by many that these societies should receive the sacraments at the hands of their own preachers, and some had ventured to administer them. The conference of 1755 was greatly agitated with this question, and the kindred one of separation from the established church was openly discussed; but after a protracted debate, it was decided to be inexpedient to form a separate church. Since the first voyage of Wesley to America in 1735, the Moravians, whom he then met, had by the simplicity and purity of their lives exerted a powerful influence on the Methodist movement. They had societies in London and elsewhere, but their numbers were limited, and they lacked that compact organization necessary for permanent success. Between 1750 and 1760 Ingham, assisted by Moravian helpers, founded more than 80 societies in Yorkshire and the neighboring counties. These were in close affiliation with the Arminian and Calvinistic societies, but had their separate conferences. In 1760 a small company of Irish, descendants of German Palatines, who had received Methodism, removed to New York, and in 1766, through the influence of Barbara Heck and Philip Embury, resumed the religious services to which they had been accustomed in Ireland. They were assisted by Capt. Webb, an officer in the British army, who had been licensed by Wesley as a local preacher. In 1769 two preachers were sent to America. These found that the country had been greatly awakened by the labors of Whitefield, and they were successful in establishing a church in New York. Whitefield had crossed the ocean 13 times, but in 1770 his work was terminated by his death at Newburyport, Mass. At this time the members in Wesley's societies amounted to 29,179. The period between 1770 and 1780 witnessed no cessation of labor by either branch of Methodism. Although a controversy on the points of difference between Arminianism and Calvinism was carried on with great ability on either side, in which Wesley and Fletcher were opposed by Shirley, Toplady, Rowland Hill, and others, not only were the societies cared for and greatly increased, but also the foundations of those great moral enterprises, the Bible, tract, and missionary societies, were laid, and much attention was given to schemes of public philanthropy. In 1771 Francis Asbury and Richard Wright had been sent to America, where the work had greatly increased, and where the first conference was held in 1773. From 1784 the history of Methodism diverges into two main branches, viz.: Wesleyan Methodism and the Methodist Episcopal church. The first assumed a distinct organic and legal status by the record in the high court of chancery of Mr. Wesley's "Deed of Declaration," and the second became an independent church in America through the

ordination by Mr. Wesley and the Rev. James Creighton of Thomas Ooke as superintendent and bishop of the Methodist societies in America, and Richard Whatcoat and Thomas Vasey as presbyters. Till his death in 1791, Wesley continued to preside at the annual conferences and to plan and direct the work. Methodism had already been introduced into England, Scotland, Ireland, Wales, the British islands, France, the United States, Nova Scotia, Newfoundland, and the West Indies. In 1791 it numbered 233 circuits, 540 travelling preachers, and 134,599 members.—*Confession.* Methodism strove at first only to restore a purified and intensified spiritual life. The careful discussion by Wesley and his fellow laborers, in the conferences and through published works, of the religious needs of the people and of the obstacles to the progress of the work of evangelization, was the occasion of the development of the Wesleyan theology. Methodism has no such elaborate and authoritative symbol as the Tridentine decrees, or the Heidelberg, the Augsburg, the Westminster, and other confessions. The substance of its doctrines is to be found in the writings of John Wesley, John Fletcher, Richard Watson, and others, and in the generally uniform teachings of the Methodist pulpit. The articles which Wesley prepared for the Methodist church in America were taken substantially from the thirty-nine articles of the church of England. Agreeing with the so-called orthodox churches in most cardinal doctrines of the Bible, the material principle of Methodism, like that of all other independent systems of theology, is to be found in its conception of the mutual relation of God and man with regard to the work of salvation through Christ. Methodism holds that the salvation or non-salvation of each human being depends solely on his own free action in respect to the enlightening, renewing, and sanctifying inworkings of the Holy Spirit. If, in respect to these inworkings, he holds himself receptively, he will be saved both here and hereafter; but if he closes his heart against these influences of the Spirit, he will continue in death both here and in eternity. With this fundamental view, all the other doctrinal peculiarities of Methodism, such as its dogma of freedom, its emphasis of the work of the Holy Spirit, its views of assurance, Christian perfection, &c., are intimately and harmoniously connected. In accord with this general principle, Methodism is Arminian in distinction from Calvinistic. Teaching the total depravity of the race through the fall of the first pair, and man's consequent absolute inability to recover a state of holiness and obedience, except as aided by divine grace, Methodism teaches that this grace of God in Christ is universal. First, as to the divine purpose: God wills the salvation of all, and Christ died for all. Secondly, as to the work of God for us, or the objective operation of grace: for as by the first Adam

"judgment came upon all men unto condemnation," so by the second Adam "the free gift came upon all unto justification of life." Thirdly, as to the work done in us, the subjective operation of grace: it enlighteneth every man, and convinceth every man, thus putting all men under probation; for "the grace of God which bringeth salvation to all men hath appeared." Methodism teaches that none of Adam's descendants are held guilty of Adam's sin until they reject the grace of Christ; *i. e.*, through the atoning work of Christ all men stand in a gracious relation to God, instead of a natural relation, and are subjects of the influence of the Holy Spirit; and they continue in this gracious relation until excluded by virtue of voluntary transgression. With this view harmonizes its teaching relative to infant baptism and salvation, and the responsibility of man for his own salvation or damnation. Methodism holds to two sacraments, baptism and the Lord's supper. As eligible to the former, it recognizes infant children and believing children and adults; to the latter, professing Christians and penitent seekers of salvation. It prescribes no exclusive mode of baptism, and dictates no exclusive posture in receiving the Lord's supper. Yet its most usual mode of baptism is by sprinkling, and that of receiving the bread and wine is in the kneeling posture. It emphasizes the doctrine of assurance, *i. e.*, that the Holy Spirit bears witness of pardon and acceptance to the justified sinner; but this is only taught as a privilege of believers, and is not made the test of Christian character. It also makes prominent the doctrine of Christian perfection, or perfect love, declaring the object of its organization to be to spread Scriptural holiness over the land. In accordance with this view, its preachers, previous to being received into its conferences, declare that they are going on unto perfection and expect to be made perfect in love in this life.—*Polity.* Methodist polity, like the Methodist confession, is to be understood only by regarding Methodism as a revival and missionary movement. Wesley thought as little of establishing a separate church polity as of publishing a separate theology. The rapidly increasing work caused him and his coadjutors great anxiety. It was their wish and purpose to leave those who had been converted through their ministrations to the pastoral care of the clergy of the establishment. But the neglect and frequent ridicule of the converts by the clergy caused many to turn back and plunge again into sin. Hence Wesley on his departure from London appointed Mr. Maxfield, a young layman, to meet and encourage the members during his absence. Maxfield, through unusual zeal, was led to take a passage of Scripture to expound. Much good followed this attempt. Wesley, however, hastened to put an end to what he regarded a disorderly procedure; but on listening to the earnest and persuasive preaching of Maxfield,

he was convinced that this was God's providential way of providing for the wants of the growing societies. About the same time John Nelson, a mason of Bristol, began to explain to his neighbors the way of salvation which he had found, and to compare and explain the Scriptures. This was the origin of lay preaching, which afterward became so important an element in the economy of Methodism. As the number of lay preachers increased and the number of converts multiplied, Wesley invited several clergymen and these lay assistants, as before mentioned, to meet him in London, "to give him their advice respecting the best method of carrying on the work of God." This first assembly that took the name of "conference" was held in the Foundery, London, June 25, 1744. That Methodism was yet but a revival within the establishment is seen from the view taken by Wesley and his associates of the relations of the Methodist societies to the church of England. Secession was discouraged, and they distinctly denied that they were dissenters. The hope was still entertained that the regular clergy might be faithful in their care of the people, and administer to them the sacraments. No provision was made for a future assembly, but conferences were held annually thereafter, and the record of their proceedings was published under the title, "Minutes of the several Conversations between the Rev. Mr. Wesley and others." Previous to the conference of 1744 the greater portion of England had been divided into "circuits," and provision had been made to supply these with preachers for such time as the need of the work seemed to indicate. Here are thus found the elements of the circuit and itinerant systems, which have been so generally maintained. During the life of Wesley the conferences were occupied in consultation respecting the best methods of conducting the evangelical work for the ensuing year, in the discussion of doctrinal questions, and in advising the lay preachers as to the proper manner of spending their time in study, preaching, and pastoral labors. Till the close of the American revolution there had been no organization of a separate church *de jure*, although since the conference of 1744 there had been a church *de facto*, of which John Wesley was the chief head and executive. While in his work as an evangelist he recognized the sole and exclusive authority of the established church wherever the English civil authority was exercised, the discussions of the several conferences, as well as Wesley's writings and conduct, clearly show that his views of ecclesiastical authority and polity underwent radical changes, and led him, at the recognition of the independence of the American colonies, to provide a separate church organization for the Methodists of America, and at his death to perpetuate his work by constituting the "United Societies" a distinct ecclesiastical body in regular legal form. Methodism holds to

no inspired or divinely imposed church polity. While it believes that certain types of church organization are found in the New Testament, it teaches that no uniformity of church government is obligatory, but that a church is at liberty to adapt its polity and government to its varying exigencies. So with the orders of the clergy. Methodism concedes that three orders early appeared in the church, but denies that these are enjoined in Scripture. Thus in Great Britain it recognizes but one order, while in America it has provided two. Agreeably with its original character as a revival and missionary movement, it feels at liberty to adjust its polity to the demands of its work. Nevertheless its government and usages are essentially similar in all its divisions, as will appear from the separate accounts of them. II. DIVISIONS OF METHODISM. The original body of Methodists in Great Britain are called Wesleyans or Wesleyan Methodists. The principal secessions from this parent body are the Calvinistic Methodists, the Methodist New Connection, the Primitive Methodists, the United Methodist Free church, the Bible Christians, and the Primitive Methodists of Ireland. There are also several minor divisions.—1. *Wesleyans, or Wesleyan Methodists.* Although the "United Society," organized in 1739, was the real origin of Methodism, the Wesleyans had no legal status till 1784, and the societies had been under the exclusive control of the Wesleys. They had assembled the conferences, and had directed the religious work. The chapels and preachers' houses had been deeded to trustees for the use of such preachers as John or Charles Wesley should send to them, and, after the death of the Wesleys, of such as the conference should appoint. Near the close of his life, John Wesley drafted the so-called "Deed of Declaration," a plan for the perpetuity of the societies. In this instrument 100 preachers named by Wesley were declared to be the legal conference, and their character and powers were clearly defined. To them was intrusted the duty of filling vacancies as they might occur. By the enrollment of this document in the high court of chancery the conference secured a corporate existence and legal status. The provisions of this deed have remained substantially the same to the present time. These members are technically called "The Legal Hundred." After the death of Wesley the church was greatly agitated by controversies relative to its polity, as well as by the political questions to which the French revolution had given rise. The celebration of the sacraments by its own preachers independently of the establishment, the powers of individual societies, and the relation of laymen to the government of the church, were among the chief subjects in controversy. These were substantially adjusted in 1795 by the adoption of a plan called "Articles of Agreement for General Pacification," although soon after a secession under the leadership of Alex-

ander Kilham resulted, and took the name of the Methodist New Connection. After Wesley's death the progress of the Wesleyan Methodists was rapid and substantial. As a revival power it was unceasing in its labors for home evangelization, and as a missionary movement it organized conferences in Ireland, France, Australia, Canada, and the other British provinces of America, and established missions in France, Germany, Italy, Spain, Portugal, continental India, Ceylon, China, western and southern Africa, the West Indies, Australia, and many of the islands of Oceania. It developed a wise and efficient financial system; it has taken active part in the great questions of emancipation and civil liberty; it laid broad the foundations of its educational system, and wonderfully developed its literary and theological character by the works of Thomas Coke, Jabez Bunting, Adam Clarke, Robert Newton, Joseph Benson, Richard Watson, Thomas Jackson, and many others. The doctrines of the Wesleyan Methodists have already been sufficiently indicated. While they have no written confession of faith, they find in the thirty-nine articles of the established church a proximate expression of their doctrinal belief; but the deeds of their churches and the courts of England recognize Wesley's notes on the New Testament and a portion of his sermons as a standard of doctrine. Its polity and government are substantially defined in the "Deed of Declaration." By this instrument the supreme ecclesiastical government is vested exclusively in the hands of the clergy. These meet annually in conference, and continue in session not less than five days and not more than three weeks. The legal conference has power to receive preachers on trial, to receive into full membership on ordination, to pass upon the character of all the preachers, to try charges against any, and to reprimand, suspend, or exscind. It is its prerogative to review and revise the proceedings of the subordinate judicatories. These are: first, the district meeting or conference, composed of ministers and laymen residing within a certain district, embracing from 10 to 20 circuits; second, the quarterly meeting, composed of local preachers, stewards, and class leaders, at which meeting, thus composed largely of the lay element of the church, candidates for the ministry are first proposed, and can be rejected without appeal; thirdly, the leaders' meeting, held monthly, and composed of the minister or ministers of a circuit, the leaders of classes, and stewards, the last having in charge chiefly the temporalities of the societies. The members of the various churches are divided into "classes," each numbering from 12 to 20 persons and placed under a "leader," who is to meet the class weekly to inquire after their spiritual condition and give such counsel and exhortation as each may need. The ministry is itinerant, preachers being appointed to a church for a single year, and eligible to con-

tinue in one circuit not more than three consecutive years. A body composed of one representative from each district meeting constitutes a stationing committee, which prepares a draft of the stations of all the ministers for the ensuing year, and submits this to the conference, where appeals are made and the scheme of appointments perfected in accordance with the demands of the work. Important improvements have been made in this polity from time to time, by which the seemingly oligarchical character of the "Legal Conference" has been modified, and the methods have been made consonant with the voice of the large body of the conference. Yet the essential principles of the original "Deed" are still retained.—In the progress of its history, Wesleyan Methodism has developed various "connectional" enterprises, as its needs have suggested. Among these are the contingent fund, established in 1756, for the support of home missionaries, for deficits of preachers on poor circuits, &c., which is sustained by an annual collection in all the societies, by donations and bequests, and by appropriations from the book room; the children's fund, founded in 1819, for equalization of the support of the children of preachers, according to the numbers and ability of the societies; the general chapel fund, founded in 1818, to relieve embarrassed chapels and stimulate the liberality of the people in repairing and building chapels and preachers' houses, by affording them help according to their own exertions; and the preachers' auxiliary fund, for the relief of superannuated preachers, their widows and orphans. This denomination had early been very zealous in the planting and support of missions both domestic and foreign. These local and unmethodical efforts were succeeded in 1818 by the "General Wesleyan Missionary Society," by which its entire missionary operations were consolidated under a regular board of managers. The amount disbursed in 1873 was about £175,000. It supports missions in every quarter of the globe. The distribution of books and tracts by the preachers in their circuits was early insisted on by Wesley. In 1782 he and Coke instituted the "Society for the Distribution of Religious Tracts among the Poor." To supply the needs of the people Wesley early had a book store and printing house of his own, which has developed into the Wesleyan book concern, one of the largest publishing houses in England, whose interests are supervised by a book steward and two editors. These have also the general oversight of the official periodicals of the denomination. The originators of Methodism early gave attention to education. In 1739 Whitefield laid the corner stone of a charity school at Kingswood for the neglected miners, which was afterward completed by Wesley. It also became the anxious inquiry at the conferences, Can we have a seminary for laborers? Its school fund was designed for the education of preachers' children at Kingswood, and after-

ward at Wood House Grove and New Kingswood. In 1837 the Wesleys formed the "Wesleyan Education Committee," and they have since manifested great interest in educational matters. They have under their control a "Proprietary College" at Sheffield, and a collegiate institution at Taunton, both standing in collegiate relations to London university; a college at Belfast, Ireland; and two theological schools situated respectively at Didsbury and Richmond. They also support an extensive system of day schools, amounting in 1871 to 889 schools and 150,765 scholars, for which teachers are trained at the Wesleyan normal school in Westminster. The statistics for 1873-'4 of the British Wesleyan church, including Great Britain, the Irish, French, and Australasian conferences, and the foreign missions, are: members, 507,107; on trial, 32,361; travelling preachers, 1,917; Sunday schools, 7,032; scholars, 261,740.—2. *Calvinistic Methodists*. This branch of the original revival movement arose from a diversity of view between Wesley and Whitefield on doctrinal points, the former advocating the Arminian theology and the latter the Calvinistic. Aided by his patron, the countess of Huntingdon, Whitefield first erected the celebrated "Tabernacle" near the site of Wesley's "Foundery" in London, and was instrumental in building churches in various parts of the United Kingdom. This branch of Methodism divided into three sects, the "Lady Huntingdon Connection," the "Whitefield Methodists," and the "Welsh Calvinistic Methodists." The first of these branches adhered to the liturgy of the established church, and adopted a settled pastorate. Their numbers are limited, yet they still maintain the Cheshunt college, which was founded by Lady Huntingdon. The Whitefield Methodists have been almost entirely absorbed into the Independent church. The third branch has been successful in labors especially in Wales and among the Welsh population in America. It numbers about 60,000 communicants in Wales, and 4,000 in America, the latter divided into four annual conferences.—3. *The Methodist New Connection* originated in 1797. The Wesleyan body had been agitated by various questions of doctrine and polity. Great uneasiness was felt by numbers of preachers and laymen because by the "Deed of Declaration" the supreme government had been vested in the clergy. This dissatisfaction manifested itself in various serious charges made against the ministry by Alexander Kilham, an ordained travelling preacher. These charges were judged by the conference of 1796 to be slanderous, and after trial Kilham was expelled. He drew after him about 5,000 members. The outlines of a constitution were published by a conference convened in 1798, and these laws and rules have been revised from time to time. The conference is composed of equal numbers of clergy and lay members. It has power to make laws and rules every seven years, but

any proposed changes in the general rules must be submitted to the quarterly conferences for examination, and must be approved by two thirds of the ensuing conference. In doctrine and general church usage this body agrees with the parent church. In addition to the home work in England, they support missions in Ireland, Canada, Australia, and China. The "Minutes" for 1874 give : chapels, 677; societies, 827; circuit preachers, 244; local preachers, 1,270; members, 33,563; Sunday schools, 590; officers and teachers, 11,566; scholars, 80,488.—4. *The Primitive Methodists* originated in 1810, in consequence of a controversy about the propriety of holding camp meetings. These meetings had been introduced into England by Lorenzo Dow, and had proved an efficient means of good to the common people. They were defended and advocated by Hugh Bourne, a zealous layman, but were declared by the Wesleyan conference of 1807 "improper" and "likely to be productive of considerable mischief." On the persistence of Bourne in his labors he was expelled in 1808; and William Clowes, a fellow laborer of Bourne, was expelled two years later. They nevertheless continued their labors with increased zeal and success. In Lancashire and Cheshire a schism in the Wesleyan church led 16 congregations and 28 preachers to be mostly absorbed into the Primitive Methodists. This church is chiefly Wesleyan in theology and discipline. Its annual conference in England is composed of two thirds lay and one third clerical members; in the United States the clerical and lay elements are equal in the annual conference. It has churches in Great Britain, Ireland, Canada, the United States, New Zealand, Australia, Tasmania, and Africa. According to the "Minutes" of 1874, its numbers are as follows: preachers, itinerant and local, 15,904; members, 166,772; Sunday school teachers, officers, and scholars, 356,276; chapels and other preaching places, 6,425.—5. *The Bible Christians* were organized in 1815 by William O'Bryan, a Wesleyan Methodist local preacher, who separated himself from that body on account of irregularities in his methods of work, and visited a destitute district in E. Cornwall and W. Devonshire, where he formed his first class. They have missions in Canada (these became independent in 1854) and Australia. They have a publishing house in England and one in Bowmansville, Canada. In doctrine they are essentially Wesleyan. In all minor courts the laity are in the majority, but every fifth conference must be composed of equal numbers of preachers and laity; to the intervening conferences the laity send one representative from each district. In 1873 this body had 1,991 itinerant and local preachers, 1,072 chapels and other preaching places, 26,427 members, and 58,089 Sunday school teachers and scholars.—6. *Other Bodies*. The lesser secessions from the Wesleyan church are chiefly the "Band-Room Methodists," who originated

in Manchester in 1806; the Primitive Methodists of Ireland, 1816; the Protestant Methodists, 1828; the "Wesleyan Methodist Association," 1835; and the "Reformers," 1849. The last three have recently been merged under the name of the "United Methodist Free Church," which in 1872 numbered 66,907 members. III. **METHODISM IN AMERICA.**—1. *The Methodist Episcopal Church* is the original and largest body of Methodists in the United States. Wesley and Whitefield, during their visits to America, had organized no Methodist societies. The nucleus of the first Methodist church in America was composed of immigrants from Ireland who had been members of Mr. Wesley's societies. In 1766 these were formed into a class and instructed by Philip Embury, who had been a class leader and local preacher in Ireland. He was greatly assisted by Capt. Thomas Webb, an officer of the British army stationed in New York, who had been licensed as a local preacher by Wesley in 1765. Webb preached and formed classes during 1768 on Long Island, and in New Jersey, Delaware, and Philadelphia. In the same year the first chapel was dedicated in John street, New York; and in 1770 the first Methodist church in Philadelphia was erected. In 1769 Boardman and Pilmore, the first missionaries sent to America by Wesley, arrived in New York and took charge of the work in that vicinity. Nearly contemporaneously with Embury, Robert Strawbridge, a local preacher from Ireland, settled in Maryland and formed a society in Frederick co., and afterward organized classes in Baltimore and Harford counties. About the same time Robert Williams had immigrated from England, and had formed the first circuit in Virginia and preached in North Carolina. In 1771 Francis Asbury arrived, and the next year he was appointed by Mr. Wesley superintendent of the American societies. He was soon superseded by Thomas Rankin, an experienced and able minister and disciplinarian. The first American conference was held in 1773, and consisted of ten preachers, all of European birth. The societies then aggregated 1,160 members. At the beginning of the revolutionary struggle nearly all the preachers of English descent, except Asbury, sympathized with the cause of the mother country, and returned home. During the war the English church in America was nearly extinguished, and the dependence of the Methodists on the English clergy for the sacraments almost entirely failed them. For this cause a majority of the Methodist preachers determined to provide for their administration independently of the English clergy. This threatened a serious rupture of the peace and harmony of the church. Under these circumstances Wesley in 1780 applied to the bishop of London to ordain at least one presbyter to administer the sacraments among the American Methodists, but was refused. Therefore in 1784 Wesley, assisted by the Rev. Thomas

Creighton and Richard Whatcoat, presbyters, ordained the Rev. Thomas Coke, LL. D., as superintendent of the American Methodist churches, with the instruction that Asbury should be assistant superintendent. On Coke's arrival a general conference of 60 ministers met in Baltimore, Dec. 24, 1784, and approved Wesley's action by unanimously electing Coke and Asbury superintendents. This conference adopted the episcopal form of government, made the episcopal office elective, and held the superintendents amenable to the body of ministers and preachers. The "Sunday Service" and twenty-five "Articles of Religion," were adopted. Thus the church first assumed organic form. From this time the progress of the denomination was rapid and assured. Before the close of the century Methodism had reached the Mississippi valley, had been established in the eastern British provinces and Canada, had been successfully preached in New England, and had met with great success throughout the middle and southern states. It was the first church to recognize officially the constitution of the United States, and to pledge its loyalty to the government. It had greatly developed its internal polity and divided its territory into annual conferences; had laid the foundations of its benevolent and educational enterprises; had introduced the Sunday school into America; had established a publishing house; had taken advanced ground on temperance; had been active in attempts to ameliorate the condition of the slave population; and had been positive in declaring the general incompatibility of slaveholding with membership in its communion. In 1800 Richard Whatcoat was elected bishop, and in 1808 William McKendree. In 1808 the plan of a delegated general conference was adopted. This body, composed of 90 members, held its first session in 1812. The church, from a single class of five members in 1766, had now increased to 195,357 members and 688 preachers.—*Doctrines.* These are expressed in the twenty-five "Articles of Religion," which, with the exception of the 23d, were prepared by Mr. Wesley from the thirty-nine articles of the church of England. With the addition of the 23d and a few slight changes, they remain as they were adopted by the conference of 1784. Article I. is the enunciation of the usual orthodox view of the nature of God, and the trinity of persons in the unity of the Godhead. Art. II. enunciates the orthodox doctrine of the incarnation, natures, suffering, crucifixion, death, burial, and the conciliatory and sacrificial character of Christ's passion. Art. III. recognizes his real resurrection and ascension. Art. IV. asserts the co-equality of the Holy Ghost. Art. V. declares the sole authority of the Holy Scriptures, and defines the canonical Scriptures. Art. VI. defines the relation of the Old and New Testament Scriptures, and affirms the binding power of the moral law. Art. VII. defines original sin, guarding against Pelagi-

anism. Art. VIII. describes the condition of man after the fall of Adam, and declares his utter inability "to do good works, pleasant and acceptable to God, without the grace of God by Christ preventing us, that we may have a good will, and working with us when we have that good will." Art. IX. enunciates the Protestant doctrine of justification by faith. Art. X. describes the character of good works. Art. XI. protests against the doctrine of supererogation. Art. XII. treats of sin after justification, declaring that "the grant of repentance is not to be denied to such as fall into sin after justification: after we have received the Holy Ghost, we may depart from grace given, and fall into sin, and, by the grace of God, rise again and amend our lives." Art. XIII. defines the visible church of Christ. Art. XIV. protests against the Roman Catholic doctrine of purgatory, pardon, worship, and adoration, as well of images as of relics, and the invocation of saints. Art. XV. declares against the practice of the Roman Catholic church in conducting her services in a language not understood by the people. Art. XVI. defines the nature and number of the sacraments, declaring against their necessarily saving efficacy. Arts. XVII., XVIII., and XIX. define more fully the nature and significance of the sacraments. "The baptism of young children is to be retained in the church." The supper of the Lord is to be administered in both kinds. Transubstantiation and the elevation of the host are condemned as unsupported by Scripture or reason. Art. XX. declares the sufficiency of the one and only offering of Christ for all the sins of the whole world, and condemns the sacrifices of masses as blasphemous and deceitful. Art. XXI. affirms the lawfulness of marriage to Christian ministers. Art. XXII. denies the necessity of uniformity in the rites and ceremonies of the church, and announces that "every particular church may ordain, change, or abolish rites or ceremonies, so that all things may be done to edification." Art. XXIII. recognizes that "the president, congress, the general assemblies, the governors, and the councils of state, as the delegates of the people, are the rulers of the United States of America according to the division of power made to them by the constitution of the United States, and by the constitutions of their respective states." Art. XXIV. denies a community of goods in the Christian church, but enforces the duty of almsgiving, &c. Art. XXV. defines the nature and asserts the right of a Christian man's oath. These articles purposely avoided the questions of Calvinism and Arminianism, and were intended as a broad platform on which all real Christians might unite.—*Polity.* The polity of the church is clearly defined in the book of its doctrines and discipline. There are five judicatory bodies, termed respectively the "General Conference," the "Judicial Conference," the "Annual Conference," the "Dis-

strict Conference," and the "Quarterly conference." Prior to 1872 the general conference was composed exclusively of preachers elected by annual conferences, also composed exclusively of preachers, so that the constituent body and the delegated body were both wholly clerical. In 1872 a plan was completed for the introduction of a lay element. The general conference now consists of one minister for every 45 members of each annual conference, chosen by ballot by the ministers themselves, and two laymen, chosen by lay electors from the several quarterly conferences within the territory of the annual conference. It meets quadrennially on the first day of May, and is presided over by the bishops. The ministerial and lay delegates meet as one body, though a separate vote can be had provided one third of the ministers or laymen demand it. In case of a separate vote, a majority of both orders is necessary to pass a measure. It is the sole legislative body of the church, limited by certain "Restrictive Rules," all of which rules are subject to revision except the first, which forbids the conference to revoke, alter, or change the articles of religion, or to establish any new standards or rules of doctrine contrary to the present existing and established standards. It elects bishops, missionary and educational secretaries, book agents, and editors of its periodicals, and is also the court of final appeal. The judicial conference is composed of "triers of appeals," seven of whom are elected by each annual conference. It tries bishops who may be accused, and also appeals of members convicted in an annual conference. To try the latter cases, the triers of three conferences must unite; to try the former, the triers of five conferences are required. Their decision is final, except that law questions may be reviewed by the general conference. The annual conference consists of travelling preachers. A bishop is the presiding officer, or in his absence the conference may appoint its president. Its powers are simply administrative. It holds its members responsible, passing their character under examination each year. Its action is subject to review by the general conference. The district conference is composed of the presiding elder of the district, pastors, local preachers, exhorters, and one steward and Sunday school superintendent from each pastoral charge. It licenses local preachers, and recommends them to the annual conference for admission or for ordination. The local preachers are amenable to this body, which also cares for the general financial, benevolent, and educational interests of the district. The quarterly conference consists of the pastor, local preachers, exhorters, stewards, class leaders, and trustees and Sunday school superintendent (if members of the church) of a single pastoral charge, over which it exercises supervision. The leaders and stewards' meeting, composed of the pastor, class leaders, and stewards, cares for the sick and needy, guards the

discipline of the members, and has power to recommend for membership and for license to exhort or preach. In common with the Wesleyans, the M. E. church divides its members into classes under appropriate leaders. This church recognizes two orders in the ministry. Its bishops are not diocesan, but have a joint jurisdiction over the whole church. They are, however, since 1872, required to reside severally within certain districts into which the territory was then divided. They preside over the annual and missionary conferences, arrange the presiding elders' districts, station the preachers annually, and exercise a general superintendence over the spiritual and temporal interests of the church. The ministry is itinerant, the ministers not being allowed to remain in the same pastoral charge more than three consecutive years. Admission to the annual conference is preceded by a probation of two years, and the completion of a prescribed course of study. The local preachers are usually lay preachers who are helpers of the regular pastor. Admission to membership is preceded by a probation of six months, to give the candidate time to acquaint himself with the doctrine and discipline of the church; but members of other churches in regular standing are received without probation. The Methodist Episcopal church has rapidly developed its educational and benevolent institutions. It discussed plans of education as early as 1780, and in 1787 it dedicated its first college. In 1817 it opened its first permanent academy, and in 1820 the general conference recommended that each annual conference establish and maintain a seminary. Its first Biblical school, projected in 1839, established at Concord, N. H., in 1847, was removed to Boston in 1867, and now forms a school of the Boston university. In 1874 it had under its supervision and control 27 universities and colleges, with 5,250 students; 69 seminaries and academies, with about 14,500 students; and 5 theological schools, one in Germany and one in India, with 428 students. The total value of school property is about \$8,500,000. Its publishing interests received early attention. Its book concern, begun in 1789 on a borrowed capital of \$600, has become the largest publishing house in America. The New York concern in 1873 had a capital of \$1,052,448, and the Western Methodist book concern at Cincinnati a capital of \$467,419. Besides these there are depositories in nearly every chief city of the United States. It publishes a quarterly review, and 5 monthly and 13 weekly periodicals. The missionary society, organized in 1819, superintends both the domestic and foreign missionary work. In 1873 it appropriated \$843,149. Its board of church extension was established in 1864; its receipts in 1873 were \$115,296 05. The Sunday school union and tract society manage its immense Sunday school and tract interests. It has also a woman's foreign missionary society, and a board of education. Its statistical returns for

1874 give the following figures: bishops, 13; annual conferences, 80; itinerant ministers, 10,845; local preachers, 12,706; members, 1,345,089; probationists, 218,432; Sunday schools, 18,958; officers and teachers, 203,409; scholars, 1,383,227; value of churches and parsonages, \$78,516,693.—2. *Methodist Episcopal Church, South.* Methodism was firmly established in the southern states at an early day. It embraced alike in its membership slaves and slaveholders, and slaveholders were found in its ministry. The subject of slavery occupied the attention of the American Methodists even prior to their organization into a distinct church. The members were at first advised to emancipate their slaves. Their local preachers were warned, and suspension and expulsion threatened in case they failed to manumit their slaves, or bought slaves for the purpose of holding them. On the organization of the church in 1784, provision was made for the spiritual care of the blacks, and slavery was declared to be contrary to the law of God and every principle of the revolution. A method was likewise adopted for the extirpation of what was affirmed to be an "abomination." It was determined that persons who should buy, sell, or give away slaves should be immediately expelled, unless they bought them with the purpose to free them. In 1796 the disciplinary question read: "What regulations shall be made for the extirpation of the crying evil of American slavery?" In the answer recommendation was made to the "yearly conferences, quarterly meetings, and to those who have oversight of districts and circuits, to be exceedingly cautious what persons they admit to official stations in our church; and in the case of future admission to official stations, to require such security of those who hold slaves for their emancipation, immediately or gradually, as the laws of the states respectively and the circumstances of the case will admit." The church was requested to consider the subject of negro slavery with deep attention till the ensuing general conference, "in order to take further steps in eradicating this enormous evil from that part of the church of God to which we are united." One of the disciplinary provisions of 1804 was that a travelling preacher, the owner of slaves, should forfeit his ministerial character in case of failure to emancipate them where the laws might permit. The church was advised to forward through appointed channels addresses and petitions to state legislatures to secure the gradual emancipation of the blacks. In 1808 it was declared that no slaveholder should be eligible to the office of elder, where the laws will admit of emancipation. In 1812 each annual conference was authorized to make its own regulations relative to buying and selling slaves. The conference of 1816 substantially reaffirmed the regulation of 1808, but extended the ineligibility to all official members. The disciplinary statements were changed from time to time,

ever maintaining a distinct protest against the evil of slavery, but guarding the rights of members and ministers in those states where the laws did not admit of the manumission of slaves. The general conference of 1840 declared that "mere ownership of slave property, in states or territories where the laws do not admit of emancipation and permit the liberated slave to enjoy freedom, constitutes no legal barrier to election or ordination of ministers to the various grades of office known in the ministry of the Methodist Episcopal church." At the general conference of 1844, the appeal of the Rev. Francis A. Harding from the decision of the Baltimore conference, suspending him from the ministry for failure to manumit slaves obtained by marriage, was argued, and the decision confirmed, it being held that the laws of Maryland allowed manumission. The case of James O. Andrew, a bishop of the church, who had come into the possession of slaves subsequently to his election, also came before the conference for examination. A resolution "that it is the sense of the general conference that he desist from the exercise of his office, so long as this impediment (slaveholding) remain," was passed by a vote of 111 to 69. After many attempts at reconciliation, the delegates from 13 annual conferences presented a declaration that this action of the conference "must produce a state of things in the south which renders a continuance of the jurisdiction of the general conference over these conferences inconsistent with the success of the ministry in the slaveholding states." This was referred to a committee of nine, who reported a plan in which provision was made for a separation, in case such a contingency should arise. It provided for the peaceful adjustment of boundary lines, and an equitable division of property. The next day after the adjournment of the conference, the southern delegates published a call for a convention of the slaveholding conferences to meet in Louisville, Ky., May 1, 1845. This convention declared the conferences there represented to be a distinct connection under the name of "The Methodist Episcopal Church, South." It also provided for its first general conference, which met at Petersburg, Va., in May, 1846. By a decision of the supreme court of the United States, the property was divided with the southern church in accordance with the provisions of the plan. This church now consists of 37 annual conferences, composed of travelling ministers and lay delegates, four of the latter from each district. The general conference is composed of an equal number of clerical and lay members. In economy and doctrine it is very similar to the Methodist Episcopal church. It has a publishing house at Nashville, Tenn., and a prosperous missionary society. Previous to the civil war it had 21 colleges for males, and 55 collegiate and academic institutions for females. It published one quarterly, two monthly, and eight weekly periodicals. Its mis-

sionary, publishing, and educational interests were greatly crippled by the war, but are now reviving. Its "Minutes" for 1873-'4 give the following figures: 3,134 travelling preachers, 5,344 local preachers, 663,106 members, and 370,102 Sunday school teachers and scholars.—3. *African Methodist Episcopal Churches.* The refusal to accord equal privileges in church sittings, in the administration of the eucharist, &c., to the colored members of the Methodist church, had caused great uneasiness and dissatisfaction. In 1787 they had discussed their grievances in a convention at Philadelphia. In 1816 a general convention of colored Methodists organized a separate church, "in order to secure their privileges and promote union among themselves." At the first general conference in 1816, Richard Allen, a principal leader in the movement, was elected first bishop. The doctrines and government of this church agree with those of the parent body. It has a book concern in Philadelphia, a weekly periodical, one college, and church property to the value of \$4,500,000. There are 10 conferences, 7 bishops, 600 travelling preachers, 1,300 local preachers, and 200,000 members. In 1819 a secession from this church was organized, under the title of the "African Methodist Episcopal Zion Church." They annually elect their superintendent, and in 1873 had 694 preachers and 164,000 members. The "Colored Methodist Episcopal Church in America," organized in 1870 from members of the Methodist Episcopal church, South, and in sympathy with her, has 3 bishops, 1,318 preachers, and 67,888 members.—4. *Methodist Protestant Church.* This body was organized by former members of the Methodist Episcopal church in 1830, primarily for the alleged reason that its government secured to the itinerant ministers the unlimited exercise of the legislative, executive, and judicial powers of the church, to the exclusion of all other classes of ministers, and of all the people. Members of several general conferences had exhibited marked dissatisfaction with some leading features of the government, and a very respectable minority struggled hard to effect important changes. A periodical, "The Wesleyan Repository," was commenced in 1820, and continued to the general conference of 1824. Numerous petitions were presented to that body, praying for a representation of ministers and laymen in the law-making department. Immediately after the adjournment of that conference a meeting was held in Baltimore, when it was determined to publish a periodical, entitled "The Mutual Rights of the Ministers and Members of the Methodist Episcopal Church," "for the purpose of giving the Methodist community a suitable opportunity to enter upon a calm and dispassionate discussion of the subjects in dispute." This meeting resolved itself into a union society, and recommended that similar societies be organized in all parts of the United States, "in order to ascertain the number

of persons in the Methodist Episcopal church friendly to a change in her government." This measure was followed by persecution and expulsion of some of the reformers. In 1826 the Baltimore union society recommended state conventions to be held in the several states to inquire into the propriety of preparing one united petition to the general conference of 1828, praying for representation, and to elect delegates to meet in a general convention for the purpose. Conventions were accordingly held, and delegates elected. In North Carolina several members of the Granville union society were expelled for taking part in this convention. In 1827 11 ministers were suspended, and finally expelled, from the Methodist Episcopal church in Baltimore, and 22 laymen, for being members of the union society. They and their friends immediately organized under Mr. Wesley's general rules, taking the title of the "Associated Methodist Reformers." In November, 1827, the general convention, composed of ministers and lay delegates elected by the state conventions and union societies, assembled in Baltimore. This convention memorialized the general conference of 1828 that the government of the church might be made representative, and more in accordance with the mutual rights of the ministers and people. To this memorial the general conference replied adversely. The reformers then withdrew in considerable numbers, in different parts of the United States, and called another general convention in Baltimore, Nov. 12, 1828. This convention drew up 17 "Articles of Association," to serve as a provisional government for the Associated Methodist churches. A subsequent convention, which was held in Baltimore, November, 1830, adopted a constitution and discipline for the government of the Methodist Protestant church. The Rev. Francis Waters, D. D., of Baltimore, was elected president. This constitution opens with the enunciation of certain elementary principles which lie at its foundation. It consists of 17 articles, defining the government and discipline of this body. This church agrees with the parent body in doctrine, but differs in ecclesiastical government. The general conference is composed of equal numbers of clergy and laity, elected by the annual conferences in the ratio of one delegate of each order for every thousand communicants. The office of bishop is not recognized, but the president of general conference is chosen by ballot. The annual conference consists of all the ordained itinerant ministers within a district, and it elects its own president. The composition, duties, and prerogatives of the general, annual, and quarterly conferences are quite similar to those of the like bodies in the parent church. In 1858 most of the annual conferences in the free states became intensely anti-slavery, and demanded of the general conference which met in Lynchburg, Va., in the month of May, such legislation as should exclude slaveholders from

the communion of the church. As the general conference refused to comply, 19 annual conferences sent delegates to a convention which met in Springfield, O., Nov. 10, 1858. This convention suspended all official connection with the other portions of the church so long as they tolerated slaveholding. Subsequently these conferences seceded from the Methodist Protestant church, and with a few from the other non-Episcopal Methodist bodies organized the "Methodist Church." This secession reduced the numerical and financial strength of the original church fully one half, leaving to it only 20 annual conferences. The Methodist Protestant church has about 65,000 members, and about \$1,500,000 worth of property. The denomination has a book concern in Baltimore, and publishes three periodicals. Its church organ is "The Methodist Protestant," published in Baltimore. It has likewise under its control four literary institutions. The Methodist church had in 1874 28 conferences, 924 preachers, and about 65,000 members. It has a book concern and publishes a paper at Pittsburgh, Pa., and supports a missionary board, a board for ministerial education, and one college.—5. *The Wesleyan Methodist Connection of America* was organized by a convention of 151 members, ministerial and lay, convened in Utica, N. Y., May 31, 1843. Prominent among its founders were Orange Scott, president of the convention, first editor and publishing agent of the denomination; Luther Lee, an able controversialist and theologian, author of "Elements of Theology;" Edward Smith, and others of large experience and good ability. In doctrine and religious usages this body is strictly Methodist. Its distinctive features appertain to questions of morality and church polity. Opposition to slavery was a principal cause of its organization. The argument ran thus: Slavery is *sin per se*; therefore slaveholders should be denied a place in the Christian church. A stringent rule was enacted, excluding from church communion not only all slave owners and slave traders, but also all who claimed that the institution is right. This denomination did much to educate the public to the point of positive opposition to slavery. A strong position was also taken against intemperance, forbidding the manufacture, sale, or use of intoxicants as beverages, and even the intentional aiding of others so to do. Fellowship with freemasonry and kindred societies is forbidden, as incompatible with the spirit and precepts of the Christian religion. The polity of this denomination unites the connectional and congregational elements. In interests merely local the churches are independent, but those which are general are placed under the supervision of the conferences, general and yearly. In the former, which meets quadrennially, rests the supreme legislative authority, while the latter are for the most part administrative. These conferences respectively elect their own presidents.

Equal representation of the laity with the ministry is secured in all the conferences by specific provision. There is but one order in its ministry, that of elders; it is believed that, in the sense of the Scriptures, bishops are but pastors, and deacons supervised the temporalities of the church. Its itineracy is voluntary, and the pastorate is purely the subject of agreement between pastor and people. There are 16 yearly conferences, mostly confined to the northern states. The connection owns a publishing house at Syracuse, N. Y., where two papers are issued, the "American Wesleyan," organ of the denomination, and the "Children's Banner." The assets are estimated at \$40,000. These interests are supervised by a publishing agent, editors, and a book committee consisting of six ministers and six laymen, all of whom are elected by the general conference. The connection has contributed liberally to the cause of Christian education, has a well organized missionary society, and a society incorporated for the aid of superannuated ministers and the needy widows and orphans of deceased ministers. It had in 1874 about 250 ministers and 20,000 members.—6. *Canadian Methodism*. Methodism was introduced into the eastern British provinces by Wesleyan missionaries as early as 1765, and was afterward greatly advanced by American itinerants sent out by Coke. Chief among these was Freeborn Garrettson, who reached Nova Scotia in 1785. Though there were classes prior to this time, William Losee, who entered Canada in 1790, is regarded as the first Methodist itinerant minister in that province. Methodism was greatly promoted by laborers from the United States, William Case, Henry Ryan, Nathan Bangs, and others, who in the face of great opposition established societies in both Lower and Upper Canada. Till the war of 1812 this work had been chiefly directed by the Methodist Episcopal church of the United States. The war interrupted this intercourse, and at its close preachers appointed to Canadian stations by the Genesee conference were regarded with suspicion. The rival claims of the American and English Methodists were adjusted in 1820 by giving to the English conference the jurisdiction of Lower Canada and to the Genesee conference that of the Upper province. This adjustment did not prove satisfactory. In 1828 the Canada conference, organized in 1824, became an independent Methodist church, with an episcopal form of government, but in 1833 a union with the British conference was effected. A portion of the church resisted this union, and has continued under the title of the Methodist Episcopal church of Canada. In government and doctrine it is like the parent body. It has three annual conferences, 228 travelling preachers, 225 local preachers, 21,618 members, 30,000 Sunday school scholars, and church property to the amount of \$2,149,776, and has charge of two collegiate institutions.

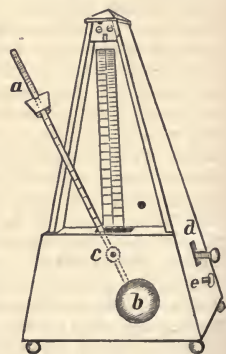
The union of the larger body of the Canadian Methodists with the British conference was discontinued in 1840, but resumed in 1847. In 1873 the British conference granted the petition of the Canadian and East British conferences to exist as independent organizations. In June, 1874, the Wesleyan conference of Canada was divided into three annual conferences; but in October a union was formed of this conference, the East British American, and the New Connectional Methodists of Canada, under the title of "The Methodist Church of Canada." This new organization has 956 travelling preachers, 100,178 members, more than 100,000 Sunday school scholars, one university, and four collegiate and academic institutions.—Other Methodist bodies are the Evangelical Association, organized in 1800, largely German, which in 1874 had 2 bishops, 15 annual conferences, 1,213 preachers, 1,184 churches, and 90,249 members; the United Brethren in Christ, also mostly German, organized in 1800, which in 1872 had 42 annual conferences, 1,709 preachers, 3,912 organized churches, and 120,445 members; and the Free Methodist church, organized in 1860, which in 1874 had 2 superintendents, 8 annual conferences, 170 preachers, and 6,000 members. IV. LITERATURE. Of the immense literature of Methodism, besides the works and biographies of its founders and early promoters, may be mentioned the following: "Annual Minutes of the Methodist Conference;" "Minutes of the Annual Conferences of the Methodist Episcopal Church" (29 vols. 8vo); "Journals of the General Conference of the Methodist Episcopal Church" (12 vols. 8vo); "History of the Religious Movement called Methodism," by Abel Stevens, D. D. (3 vols. 8vo, New York, 1861); "History of Methodism," by George Smith (3 vols. 8vo, 1862); "History of the Methodist Episcopal Church," by Nathan Bangs, D. D. (4 vols. 12mo); "History of the Methodist Episcopal Church," by Abel Stevens, D. D. (4 vols. 8vo); "History of the Discipline of the Methodist Episcopal Church," by Robert Emory, with additions by the Rev. W. P. Strickland; "History of the Great Secession," by Charles Elliott, D. D.; "The Oxford Methodists," by the Rev. L. Tyerman (London, 1873); "History of the Organization of the M. E. Church, South," by A. H. Redford, D. D.; "Annals of Southern Methodism," by the Rev. Charles F. Deems; "History of Methodism in Canada," by G. F. Playter; "History of Canadian Methodism," by the Rev. John Carroll (4 vols. 8vo); "History of the Missions of the Methodist Episcopal Church," by the Rev. W. P. Strickland (Cincinnati, 1850); "Theological Institutes," by the Rev. Richard Watson, D. D., with an analysis by the Rev. John McClintock, D. D.; *Systematische Theologie einheitlich behandelt*, by William F. Warren, D. D. (8vo, Bremen, 1863); "Defence of our Fathers," by Bishop Emory; and "Church Polity," by Abel Stevens, D. D. For a complete bibliography of

Methodism down to 1865, see the above work of Dr. Warren.

METHODIUS. See CYRIL AND METHODIUS.

METRE, and Metrie System. See WEIGHTS AND MEASURES.

METRONOME, an instrument for measuring time in music. It is a kind of pendulum whose centre of oscillation is beyond the point of suspension, contrived so that it may be easily carried about and placed conveniently on a table. The first metronomes went without clockwork, consisting simply of a rod with sliding balls at either end, and suspended near the middle on a horizontal rod which served as an axle. (See MECHANICS.) The modern instrument is kept in motion by clockwork, and usually consists of a wooden pyramidal box on the front of which is a graduated scale of figures numbering from above downward. A pendulum, bearing a sliding weight *a* and a bob *b*, has its rod graduated with marks corresponding to those on the scale. As the sliding weight is moved up, the centre of oscillation is moved further beyond the point of suspension *c*, and the vibrations take place more slowly. The scale in the instrument from which the drawing was made has a range from 40 to 208, the numbers corresponding to the number of beats per minute, which is the unit of time. In some instruments a bell has been added, arranged so as to strike at the beginning of each bar. The knob shown at *d* moves the bell by means of a slide; *e* is the key for winding. Modern composers are in the habit of marking their compositions with the metronomic signs, and many of the principal works of the older composers have recently been thus marked by the editors. These signs



Metronome

consist of a note together with its numerical or metronomic value. For example, if a movement is marked $\text{♩} = 132$, that implies that when the sliding weight is set at 132 on the scale the pendulum will vibrate once to each quarter note in the bar. Similarly, $\text{♩} = 80$ would signify that when adjusted at 80 the pendulum would vibrate once to each half note. The credit of this invention is usually given to Maelzel, but it more properly belongs to Diederich Winkel of Amsterdam, who made the first instrument about 1815. Maelzel improved upon it somewhat, and appropriated the invention.

METTERNICH. I. Clemens Wenzel Nepomuk Lotnar, prince, an Austrian statesman, born in

Coblentz, May 15, 1773, died in Vienna, June 11, 1859. He first appeared in public life as master of ceremonies at the coronation of Leopold II. (1790). Subsequently he studied jurisprudence for a time in Mentz, made a journey to England in 1794, became Austrian ambassador at the Hague, and married in 1795 the granddaughter and heiress of Prince Kaunitz, whose large domains, added to his own patrimony, made him one of the wealthiest landholders of Germany. He attended the congress of Rastadt in 1797-'9, and was ambassador in Dresden in 1801, in Berlin in 1803-'4, and in Paris in 1806, where Napoleon received him with the remark: "You are very young to represent so powerful a monarchy." "Your majesty was not older at Austerlitz," replied Metternich. In 1807 he concluded at Fontainebleau the convention by which Braunau was restored to Austria, and the Isonzo river made the boundary of Italy. In 1809, on the outbreak of the war between Austria and France, Metternich joined the emperor Francis in Hungary, and succeeded Count Stadion as minister of foreign affairs. In 1810 he conducted the negotiations with Champigny in regard to Napoleon's marriage with Maria Louisa, and subsequently escorted the archduchess to Paris. Yet he never ceased to watch the ambitious designs of Napoleon, and kept himself in constant communication with the English and Russian governments. Napoleon, in his interview with him in Dresden, June 27, 1813, accused Metternich of conspiring against him, while professing to conclude with him a treaty of peace. In fact, while Metternich was making proposals of peace to Napoleon, a formal treaty was concluded at Reichenbach, by which Austria engaged to declare war against France in case the conditions which were to be proposed at Prague should not be accepted. This treaty was for a long time kept secret. The formal declaration of war was drawn up by Metternich's order, Aug. 11, and the quadruple alliance was concluded by him at Teplitz, Sept. 9. Metternich's great influence in this war soon became apparent. The kings of Bavaria and Württemberg were induced to forsake Napoleon by a secret provision made through Metternich that they should be protected against popular disturbances, and should receive additional possessions. He was rewarded by the Austrian emperor with the hereditary dignity of a prince of the empire, conferred on the eve of the battle of Leipsic. He took a leading part in all subsequent conferences and treaties. When the congress of Vienna opened, he was unanimously chosen to preside over its deliberations. He attended the congress of Aix-la-Chapelle in 1818, was chancellor of state in 1821, attended the congress of Verona in 1822, and until the revolution of 1848 exercised a remarkable ascendancy over the affairs of Austria and Europe, as the leading champion of conservatism. He was strenuously opposed to the policy of

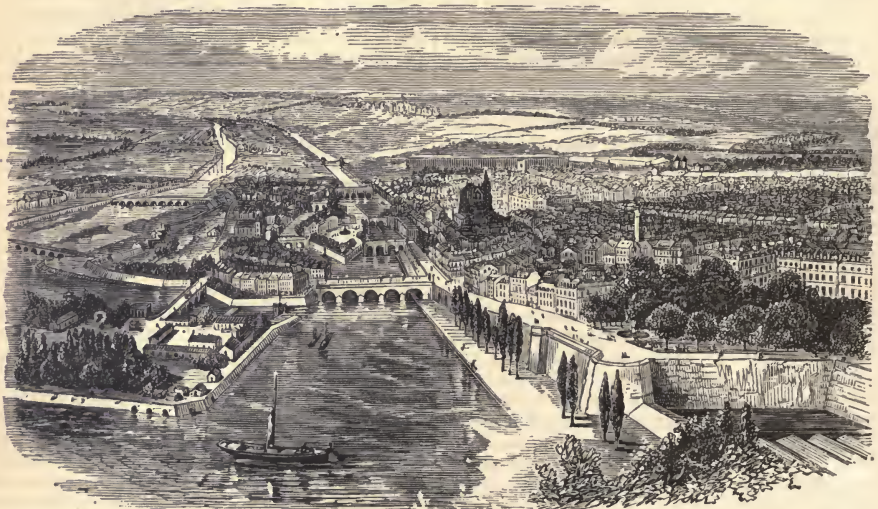
France as inaugurated by the revolution of 1830. After the death of Francis (1835) Metternich remained in office as chancellor and prime minister to his successor Ferdinand. In 1840 and 1841, during the complication of the oriental question, he exerted his influence in favor of the maintenance of peace abroad. At home his iron rule prepared the way for the revolution which terminated his power (March 13, 1848). Barely escaping with his life from the people, he fled through Holland to England, where he remained till November, 1849. He next removed to Brussels, and in 1851 returned to Vienna. On his way thither he visited his estate on the Johannisberg, which had been presented to him by Francis in 1816, but which during the revolutionary movements in Germany in 1848-'9 had been taken from his control, and while there received a visit from Frederick William IV. of Prussia. Without resuming public office, he continued until his death to exercise great influence in political affairs. The prince was fond of letters and art; and in one of his letters to Alexander von Humboldt he remarks that his inclination would have led him rather to the sphere of science than to that of diplomacy. In addition to his Austrian titles, he was created by the king of Naples duke of Portella, with a pension of 60,000 Neapolitan ducats, and was made a Spanish duke, while honors and presents were showered upon him by all European potentates. **II. Richard**, prince, eldest son of the preceding by his second wife (the baroness of Leykam and countess Beilstein), born in Vienna, Jan. 7, 1829. After officiating as ambassador in Dresden and as attaché to the ministry of foreign affairs during the war of 1859, he became soon after the peace of Villafranca (July 11, 1859) ambassador at Paris, and held the post till December, 1871. He was made hereditary councillor of the Austrian empire in 1861, and privy councillor in 1864.—He married in 1856 his niece, the princess PAULINE (born Feb. 26, 1836), a daughter of Count Maurice Sándor, and the heiress of vast estates. The princess became an intimate friend of the empress Eugénie and a brilliant leader of society in Paris during the second empire.

METTRAY, an agricultural and penitentiary colony of France, in the department of Indret-Loire, 5 m. N. of Tours, on the railway to Le Mans. It is a celebrated establishment for the reformation of juvenile offenders, which is supported mainly by its own labor, and to some extent by voluntary donations and annual subscriptions. Frédéric Auguste Demetz (who was born May 12, 1796, and died at Mettray, Nov. 8, 1873) was the founder. He studied law, and for several years was a judge of the court of *police correctionnelle* at Paris. In order to learn the best way to reform juvenile criminals, he investigated the agricultural colonies in Hamburg, Belgium, and Holland for the reformation of young offenders, and in 1836 made a tour of inspection of the peni-

tentiaries in the United States. On his return to France, M. Demetz, in connection with the viscount Bretignières de Courteilles, established in 1839 the colony of Mettray, the viscount offering a portion of his own estate for the experiment. In July they assembled 23 young men and began training them for teachers for the young offenders who were to be brought there. In January, 1840, they admitted 12 young criminals, and gradually increased the number, till in August, 1872, 792 were under training; and from the foundation to that date 4,287 had been received. The boys are divided into families of 50; the labor is chiefly agricultural, though various trades are carried on; and the establishment is almost wholly self-supplied, though not entirely self-supporting. After the death of Courteilles (1854) the superintendence of the establish-

ment devolved on Demetz. Demetz published *Projet d'établissement d'une maison de refuge pour les prévenus acquittés à leur sortie de prison* (Paris, 1836); *Lettre sur le système pénitentiaire* (1838); *Rapport sur les pénitenciers des États-Unis* (1839); *Résumé sur le système pénitentiaire* (1847); *Rapport sur les colonies agricoles* (1856); and an interesting series of annual reports to the *société paternelle* on the condition of the colony of Mettray.

METZ, a fortified city of the German Reichsland of Alsace-Lorraine, at the confluence of the Seille and Moselle, 80 m. W. N. W. of Strasburg; pop. in 1871, 51,388, which has been much diminished by French emigration since the cession to Germany. The city is surrounded by a regular system of fortifications, and entered by nine gates with drawbridges. The most important works were



Metz.

commenced by Vauban and Belle-Isle and completed by Cormontaigne; and since the German occupation the fortifications have been improved and extended. The esplanade in the centre of the city is a beautiful promenade; the quarter on the right side of the Moselle contains many steep and narrow streets. Among the principal public buildings are the arsenal, the cathedral, the churches of Notre Dame de la Ronde and of the abbey of St. Vincent, both of great antiquity, the military hospital, the hall of justice, and the public library. Besides many Roman Catholic churches and convents, it contains a Calvinist church and several synagogues. It has manufactories of woollen goods, hosiery, plush, embroidery, beer, tiles, and nails. Its manufacture of silk plush for hats is very extensive.—Metz was known to the Romans under the name of Divodurum, changed subsequently to that of Mediomatrici,

having been the capital of that tribe of Belgic Gaul; in the 5th century it was called Mettis or Metis. It became celebrated as the capital of Austrasia, which was afterward called the kingdom of Metz, and which in the middle of the 9th century assumed the name of Lorraine. Early in the 10th century Metz fell into the power of Henry the Fowler of Germany, and subsequently became a free imperial city, famous for its commerce, its brilliant society, and its love of letters and art. As the seat of one of the three bishoprics of Lorraine, it witnessed many commotions caused by the rivalries of the citizens and clergy. In 1552 it was occupied by Henry II. of France, besieged several months by Charles V., and successfully defended by the duke of Guise. It was annexed to France by the treaty of Westphalia (1648). At the beginning of the war of 1870 the third corps of the French army was

stationed at Metz under Marshal Bazaine. Napoleon III. arrived there on July 28 and assumed the chief command. After the defeats at Wörth and Forbach, Aug. 6, about half of the French army was concentrated here, and on the 8th Marshal Bazaine assumed command. On the 14th the emperor with the vanguard left Metz and crossed the Moselle, and on the same day the first attempt of Bazaine to prepare for retreat was checked by the battle of Courcelles. The immediately succeeding battles of Mars-la-Tour on the 16th, and Gravelotte, 18th, drove the French within their fortifications, and Metz was now closely besieged by the Germans under Prince Frederick Charles. The subsequent attempts of Bazaine to break out were defeated, the more important sorties being repulsed on Aug. 26, 31, Sept. 1, 22-23, 27, Oct. 2, and 7-8. On Oct. 27 Metz capitulated, Bazaine surrendering his entire force to Prince Frederick Charles. (See **BAZAINE**.) By the treaty of Frankfurt, May 10, 1871, Metz was included in the cession of the Alsace-Lorraine territory to Germany. For the surrender at Metz Marshal Bazaine was tried by court martial at Versailles, the duke d'Aumale presiding. At the conclusion of the trial, Dec. 10, 1873, the judges declared Bazaine guilty of the capitulation of Metz and of the army in the open field without doing all that was prescribed by honor and duty to avoid the surrender. He was unanimously condemned to death, and to degradation from his rank previous to his execution; but all the members of the court signed an appeal for mercy, which the duke d'Aumale in person presented to President MacMahon, who commuted Bazaine's sentence to 20 years' seclusion. He was sent to the island of Ste. Marguerite, but escaped Aug. 9, 1874.—See *Die Operationen der zweiten Armee vom Beginn des Kriegs bis zur Capitulation von Metz*, by the baron von der Goltz (Berlin, 1873).

METZU, Gabriel, a Dutch painter, born in Leyden in 1615, died there in 1658, or according to some authorities in 1669. In his youth he settled in Amsterdam, where he rose to eminence as a genre painter, being distinguished for minute imitation of nature. He painted a few portraits, including one of Admiral Van Tromp now in the Louvre. His pictures bring very high prices.

MEUDON, a village of France, in the department of Seine-et-Oise, built upon an eminence on the left bank of the Seine, and on the Paris and Versailles railway, 3 m. S. W. of Paris and 2 m. S. W. of Fort Issy; pop. in 1866, 5,417. During the siege of Paris, Meudon was occupied by the 11th German army corps, which during the night of Jan. 13, 1871, repulsed a vehement sortie of the troops of Paris. The castle of Meudon, during the latter years of the second empire the summer residence of Prince Napoleon, was burned on Jan. 30.

MEULEN, Antoine François van der, a French artist, born in Brussels in 1634, died in Paris,

Oct. 15, 1690. He was in early youth a pupil of Peter Snayers, a painter of battles, and was invited to Paris to paint campaign scenes in the life of Louis XIV. He passed the rest of his life there, and was esteemed as a painter of battles, hunting scenes, and cavalcades.

MEURSIUS, or **De Meurs, Johannes**, the elder, a Dutch scholar, born at Loosduinen, near the Hague, in 1579, died in Sorø, Denmark, Sept. 20, 1639. He was tutor to the sons of Barneveldt, and in 1610 became professor of history at Leyden, and in 1611 of Greek. The states of Holland conferred on him the title of historiographer, but on the execution of Barneveldt he was subjected to persecution, and in 1625 accepted the appointment of professor of history in the university of Sorø. He wrote numerous monographs on Greek and Roman antiquities, and his collected works fill 12 volumes folio (Florence, 1741-'63).—His son **JOHANNES** (1613-'54) also distinguished himself as an antiquarian scholar.

MEURTHE-ET-MOSELLE, a N. E. department of France, in the old province of Lorraine, bordering on Belgium, Luxemburg, the German Reichsland of Alsace-Lorraine, and the departments of Vosges and Meuse; area, 2,025 sq. m.; pop. in 1872, 365,137. By the treaty of Frankfurt, May 10, 1871, Germany took from France almost one half of the department of Meurthe and nearly the whole of Moselle. By a law of the French national assembly, Sept. 11, 1871, the portions of Meurthe and Moselle remaining were united under the provisional name of Meurthe-et-Moselle. The principal river is the Meurthe. The surface is generally uneven, but none of the hills are more than 700 ft. high, and they are covered with forests, fruit trees, and vineyards. The soil is generally fertile, and the department is noted for the variety of its productions. Among the minerals are iron, copper, lead, building stone, and gypsum. There are some manufactures of linen, muslin, canvas, and woollen stuffs. It is divided into the arrondissements of Nancy, Lunéville, Toul, and Briey. Capital, Nancy.

MEUSE (anc. *Mosa*; Dutch, *Maas*; Flem. *Macse*), a river which rises in the department of Haute-Marne in France, and, flowing mainly N. through Vosges, Meuse, and Ardennes, enters Belgium near Charlemont. From Namur it flows N. E. till near its entrance into Holland, when again it bends N., then flows N. W., and finally W. A little below Gorkum it divides into two branches, one of which takes the name of Merwede, and, after again dividing and forming with its arms the island of Ysselmonde, falls into the North sea amid shoals and quicksands; while the other branch, which flows more to the south, and likewise subdivides into two smaller streams, discharges its waters by these channels into different parts of the same sea. The delta of the Meuse is larger than that of any other European river. Its principal tributaries are: in

France, the Mouzon and the Chiers; in Belgium, the Lesse, the Sambre, and the Ourthe; in Holland, the Waal, the Leek, and the western Yssel. The chief cities on its banks are Verdun, Sedan, Mézières, and Charlemont, in France; Namur and Liège, in Belgium; Maestricht, Venloo, Dort, and Rotterdam, in Holland. The river is over 550 m. long, and it is navigable to Verdun, 430 m. from the sea.

MEUSE, a N. E. department of France, in the old province of Lorraine, bordering on Belgium and the departments of Meurthe-et-Moselle, Vosges, Haute-Marne, Marne, and Ardennes; area, 2,368 sq. m.; pop. in 1872, 284,725. The Faucilles mountains traverse it from S. E. to N. W., and send off numerous ramifications. The chief rivers are the Meuse, Aisne, Aire, and Orne. Cotton and iron are manufactured. It is divided into the arrondissements of Bar-le-Duc, Commercy, Montmédy, and Verdun. Capital, Bar-le-Duc.

MEW, or *Sea Mew*, a name given in Great Britain to some of the smaller gulls, and especially to the common European species (*larus canus*, Linn.), called also winter mew.

MEXICAN PICTURE WRITING. See **HIEROGLYPHICS**.

MEXICO (ESTADOS UNIDOS DE MÉJICO; Aztec, *Mexitli*), a federal republic occupying the S. W. portion of the continent of North America, between lat. 15° and 32° 42' N., and lon. 86° 34' and 117° 7' W. It is bounded N. and N. E. by the United States; E. by the gulf of Mexico and the Caribbean sea; S. E. by Balize; S. by Guatemala; and S. and W. by the Pacific. Its maximum length from the Guatemala frontier to the extreme N. W. limit is 1,990 m.; its maximum breadth, about lat. 26° N., is 750 m.; the breadth in lat. 19°, between Vera Cruz on the Atlantic and Manzanillo on the Pacific, is but 540 m., and the minimum distance between the two oceans, 140 m. from N. to S., is on the isthmus of Tehuantepec. The republic is divided into 27 states, one federal district, and one territory, which, with their areas, population, and capitals, according to statistical reports of 1869 and 1873, but chiefly the former, are as follows:

STATES.	Area in sq. m.	Population.	Capitals.
Aguas Calientes....	2,216	160,680	Aguas Calientes.
Campeachy.....	26,088	80,866	Campeachy.
Chiapas.....	16,769	193,987	Chiapas.
Chihuahua.....	105,295	179,971	Chihuahua.
Coahuila.....	61,050	95,397	Saltillo.
Colima.....	2,893	68,383	Colima.
Durango.....	42,643	155,077	Durango.
Guanajuato.....	11,180	874,043	Guanajuato.
Guerrero.....	24,226	800,029	Guerrero.
Hidalgo.....	8,480	494,207	Pachuca.
Jalisco.....	48,967	924,580	Guadalajara.
Mexico.....	9,598	650,693	Toluca.
Michoacan.....	21,609	618,240	Morelia.
Morelos.....	1,898	147,039	Cuernavaca.
Nuevo Leon.....	14,863	174,000	Monterrey.
Oajaca.....	27,889	646,725	Oajaca.
Puebla.....	9,598	697,788	Puebla.
Querétaro.....	8,429	158,286	Querétaro.
San Luis Potosi.....	28,889	476,509	San Luis Potosi.
Sinaloa.....	25,927	163,095	Culiacan.

STATES.	Area in sq. m.	Population.	Capitals.
Sonora.....	51,022	109,388	Ures.
Tabasco.....	12,716	83,707	San Juan Bautista.
Tamaulipas.....	28,659	108,778	Ciudad Victoria.
Tlaxcala.....	1,498	121,665	Tlaxcala.
Vera Cruz.....	27,433	459,262	Vera Cruz.
Yucatan.....	32,658	422,865	Mérida.
Zacatecas.....	26,585	397,945	Zacatecas.
Lower California (territory).....	85	275,996	Mexico.
Total.....	50,083	21,645	La Paz.
Total.....	761,640	9,169,707	

In the tables for 1873, giving a total of 9,400,000, the population of some states was exaggerated. The most densely populated regions are the table lands and the slopes of the Cordillera. There are in the republic 18 cities or towns whose population exceeds 20,000; in 12 of them it is above 30,000, and in 5 more than 50,000.—In regard to geographical position, Mexico is highly favored. It lies between two great oceans, has a northern frontier of 1,400 and a southern of 345 m., and a seaboard of 6,086 m., 1,677 m. of which are on the gulf of Mexico and the Caribbean sea, and 4,408 m. on the Pacific, including 2,040 m. of shore washed by the gulf of California. The coasts, being deeply indented, especially in the peninsula of Lower California, with numerous bays and gulfs, and fringed with capes, points, and promontories, are extremely irregular in outline. The principal gulfs are those of Mexico and California, the first of which ranks among the largest in the world. The more noteworthy bays are those of Caborca, San Juan Bautista, La Bruja, and Tegúce, on the coast of Sonora; Campeachy and Tehuantepec, washing respectively the N. and S. shores of the isthmus of Tehuantepec; San Luis, Las Animas, Malaga, Santa Marina, Magdalena, San Francisco or San Sebastian, and Molejé, in Lower California; La Asuncion, Espiritu Santo, and Chetumal, in Yucatan. The principal capes are Catoche in Yucatan, Rojo in Vera Cruz, Corrientes in Jalisco, and Pulmo, San Lucas, San Lazaro, San Eugenio, and San Quentin, in Lower California. All the coasts washed by the Caribbean sea and the gulf of Mexico are low, flat, and sandy, except near the mouth of the Tabasco river, where the heights of San Gabriel extend N. E. and S. W. for about 30 m.; but the majestic mountains of Vera Cruz, visible many leagues to seaward, form a picturesque background which relieves the monotony of the shore region of that state. On the Pacific side the coasts, though generally low, are here and there roughened by spurs extending from the Cordillera toward the ocean. Off the N. E. coast of Yucatan are some islands; that of Cozumel, called by the primitive inhabitants of the peninsula the island of Swallows, and by the Spanish conquerors Santa Cruz, has an area of about 300 sq. m., abounds in forests of precious timber, and is celebrated as the shrine to which the ancient Mexicans made pilgrimages



MEXICO

English Miles
0 20 40 60 80 100 120 140 160 180 200

1° West 22° from Washington

16°

14°

10°



1° West 99° from Greenwich

95°

91°

87°

to worship their idols in temples, the ruins of which are still visible. Cármen island or Perla del Golfo, in the bay of Campeachy, is 16 m. long and about 2 m. wide, with a seaport of the same name. Other islands in the gulf of Mexico are the islas de los Sacrificios near Vera Cruz, and the islet on which was built the fort or castle of San Juan de Ulua just opposite Vera Cruz, famous in Mexican history. Guadalupe, Cerros, San Benito, Lobos, and Santa Margarita islands are situated off the W. shore of Lower California; in the gulf of California are those of Angel de la Guarda (67 m. long), Tiburon, Cármen, and Cerralvo; and the islets of Revillagigedo are about 250 m. to seaward. The harbors on the Caribbean sea, where the commerce is quite unimportant, are excellent; while those of the gulf of Mexico (Progreso, Campeachy, Tabasco, Coatzacoalcos, Vera Cruz, and Tuxpan) have only open roadsteads, the shore being unapproachable by any kind of craft during the prevalence of northers; and the ports of Tampico, on the Pánuco, and Matamoros, on the Rio Grande, are not always accessible even to vessels of small draught. By far the most commodious harbors in the republic are those on the Pacific and the gulf of California, the principal being Acapulco, Manzanillo, San Blas, Mazatlan, Guaymas, and La Paz.—The face of the country is extremely diversified. The littoral regions are in general low and sandy, especially on the Atlantic side, where they were probably submerged at no remote period as far as the foot of the mountains. In no part of the republic within 30 m. of the sea does the land rise higher than 1,000 ft., except perhaps in Chiapas, where the chain of the Mexican Andes presents a mural barrier facing the ocean, toward which the descent is exceedingly rapid. But the traveller journeying inland from either side, N. of the Tehuantepec isthmus, climbs by a succession of gigantic terraced mountains to a table land with a mean elevation of 8,000 ft., extending far beyond the northern limits of the republic. On the railway from Vera Cruz to the capital, every variety of climate is experienced within the space of a few hours, and the natural productions peculiar to each are successively passed in review, from the sugar cane, indigo plant, and plantain of the tropics, to the pines, firs, and lichens of the north. The Cordillera of the Andes enters the Mexican territory from Guatemala, and to about lat. $17^{\circ} 30'$ extends almost midway between the Atlantic and Pacific oceans; from that point it curves nearly due N. to lat. $21^{\circ} 15'$, and approaches the E. coast, attaining its maximum elevation somewhat S. of the parallel of Mexico city, between Toluca on one side and Jalapa and Cordova on the other, where several peaks rise to 15,000 and 17,000 ft. above the sea. Still further N. the Sierra Madre runs N. by W. toward Guanajuato, near which city it widens considerably and separates into three distinct branches, the most

easterly of which trends in a generally northern direction through Nuevo Leon to lat. $24^{\circ} 30'$, then bends N. W., and, traversing Coahuila, gradually declines in elevation as it approaches the Rio Grande. The central branch, or Cordillera de Anáhuac, the highest of the three, runs N. W. through Zacatecas, Durango, and Chihuahua, taking successively the names of Sierra de Acha, Sierra de los Mimbres, Sierra Verde, and Sierra de las Grullas; about lat. 30° it is united by a system of spurs with two lateral chains, that of Texas to the east, and that of Sonora to the west. The western chain, or Cordillera proper, runs nearly parallel to the last through Michoacan, Jalisco, Zacatecas, Sinaloa, and Sonora, and is linked by spurs advancing westward to the maritime Alps of California. That portion of the Mexican Andes richest in silver is comprised between lat. 16° and 29° , while the alluvial auriferous soil continues a few degrees further northward. A striking similarity between the general structure of the Mexican and that of the South American Andes is observable in the *barrancas* or vast fissures frequently intersecting the Cordilleras. The backs of the mountains form very elevated plateaus or basins, sufficiently uniform in height to be regarded as one continuous table land. The valley of Mexico is an elliptical plain with an area of about 940 sq. m., fringed on the east, south, and west by lofty peaks, some of which are active volcanoes. Indeed, the plain may be regarded as one vast volcanic hearth, roughened at intervals by isolated hills rising abruptly from the surrounding level. The most elevated summits are at the southeast, where Popocatepetl and Iztacihuatl tower majestically over all the rest. So regular is the great plateau (formed exclusively by the broad, undulating, flattened crest of the Mexican Andes, and not the swelling of a valley between two mountain ridges, such as the alpine valley of Bolivia or that of Thibet), and so gentle are the slopes where depressions occur, that the journey from Mexico to Santa Fé, New Mexico (about 1,200 m.), might be performed in a four-wheeled vehicle. From Mexico S. to Oajaca, in the centre of the plain of that name, with an elevation varying from 3,000 to 6,000 ft., the route is almost as level as from the capital northward. Traces of volcanic fire, so numerous near the W. coast of Guatemala and in San Salvador, disappear in the gneiss-granite mountains of Oajaca; but they again become apparent, perhaps for the last time toward the north, in the central Cordillera de Anáhuac. There a line of summits, comprising the volcanoes of Tuxtla, Orizaba, Popocatepetl, Iztacihuatl, Toluca, Jorullo, and Colima, extends, between lat. $18^{\circ} 15'$ and $19^{\circ} 30'$, almost due E. and W. across the republic, and lies nearly perpendicular to the great axis of the chain of Guatemala and Anáhuac. The following are the principal mountain peaks of Mexico, the first ten being volcanoes, with their heights according to the most recent measurements:

MOUNTAINS.	STATES.	Elevation in feet.
Popocatepetl	Mexico	17,540
Orizaba	Vera Cruz and Puebla	17,176
Toluca	Mexico	16,610
Iztacihuatl	Mexico and Puebla	15,705
Colima	Jalisco	12,000
Zapotlan el Grande	Jalisco	9,299
San Martin or Tuxtla	Vera Cruz	9,708
Tancitaro	Michoacan	9,596
Jorullo	Michoacan .....	.....
Soconusco	Chiapas	7,496
Guarda	Mexico	16,748
Ajusco	Mexico	15,682
Zacualtipan	Mexico	14,858
Cofre de Perote	Vera Cruz	14,809
Zempoaltepec	Oajaca	10,542
La Brea	Guerrero	11,789
Pico de Quinceo	Michoacan	10,608
Veta Grande	Zacatecas	9,041

Of the volcanoes, Orizaba, Iztacihuatl, Popocatepetl, Toluca, Jorullo, and Colima form an E. and W. line nearly across the republic, and will be found described under their own names. The first four rise far above the limit of perpetual snow. San Martin or Tuxtla, in the mountains and near the town of the latter name, in the state of Vera Cruz, emits day and night a column of flame visible far to seaward in the gulf. Its last eruption occurred shortly after the conquest.—Mexico is very imperfectly watered, having comparatively few rivers, and but a small number of these, owing to the peculiar topography of the country, are navigable. The largest is the Rio Bravo del Norte or Rio Grande, which forms part of the boundary with the United States, collecting the waters of the Mexican rivers Conchos (itself of considerable magnitude), Salada, and Sabinas, and of several minor streams. The Pánuco, with its numerous tributaries, drains a portion of Guanajuato, Mexico, San Luis Potosí, and Tamaulipas, and empties into the gulf 5 m. below Tampico. It is navigable by small vessels for about 30 m. from its mouth, which is obstructed by a bar with but 9 ft. of water. The Alvarado and Coatzacoalcas descend from the Oajaca mountains, traverse that state and Vera Cruz, and fall into the gulf 50 and 140 m., respectively, S. E. of the city of Vera Cruz. But for the bar at its mouth and numerous shoals, the Coatzacoalcas might be navigated for a considerable distance by large vessels. The Grijalva or Tabasco takes its rise in Guatemala, enters Mexico by the southern frontier of Chiapas, which state and that of Tabasco it traverses, and empties into the gulf at the N. E. corner of Tabasco by two mouths. This river passes the capitals of the two states just named, between which it flows under a high mountain; it is deep and often rapid, and in the lower half of its course, which lies through a thickly wooded country, is navigable by schooners. The impetuous Usumasinta also rises in Guatemala, flows through Chiapas and Tabasco, and discharges in the Laguna de Términos in Yucatan, being linked to the Tabasco by a number of *caños* or transversal canals. The Chimalapa rises in the same watershed as the Coatzacoalcas

and holds a hurried course to Tehuantepec bay. The chief river of Oajaca is the Verde, descending in the same watershed as the two preceding, and falling into the Pacific about lon. 97° 30' W., after a generally S. W. course of 200 m., passing the city of Oajaca. From the state of Mexico descend two large rivers to the Pacific: the Mescala or Balsas, which rises near Huastepoc on the W. slope of the Sierra Madre, and after a winding course S., S. W., and S. through Mexico, Michoacan, and Guerrero, falls into the sea at the small but commodious port of Zacátula, which name is often given to the lower portion of the river; and the Santiago or Lerma, rising in the lake of the latter name, and flowing N. W. 325 m. into Lake Chapala, from which it issues at the opposite end, to pursue its course 275 m. further to the port of San Blas. Shortly after leaving the lake it forms a magnificent cascade. Principal among the rivers flowing into the gulf of California are the Culiacan, Fuerte, Mayo, Yaqui, and Colorado; the last is navigable by the largest vessels from the frontier to its mouth. Mexico has 59 lakes and lagoons, the most important of which are those of the valley of Mexico, viz.: Tezcuco, with an area of 99 sq. m.; Chalco, 54 sq. m.; Xochimilco and Xaltócan, 27 sq. m. each; Zumpango, 9 sq. m.; and San Cristóbal, 6 sq. m. Some of them overflow during the rainy season, jeoparding the city of Mexico, which has often narrowly escaped destruction by inundations. Of the very imperfect system of drainage that exists, a portion was established by the ancient Aztecs, who likewise constructed the canal connecting Tezcuco, Xochimilco, and Chalco. The first of these is navigated by flat-bottomed steamers; but it is the exclusive depository of the city sewage, and to the consequent miasmatic exhalations the insalubrity of the capital is mainly due. Another large and important lake is Chapala, in Michoacan and Jalisco, also navigated by steam. Of the remaining 52 lakes none deserve special mention, although some are of considerable extent.—The geology of Mexico has been but imperfectly studied. The mountains in the extreme southeast are mainly composed of porphyry, with some limestone and clay slate, in which last veins of silver, copper, and lead frequently occur. The Oajaca system is chiefly of granite, especially in the loftiest peaks; and granite forms the rocky foundation of the central table land, where however the upper strata exhibit an extensive superstructure of porphyries rich in precious metals, together with basaltic lavas, trachyte, clay slate, amygdaloid, syenite, serpentine, dolorite, and limestone and sandstone. The Cerro del Mercado in Durango is said to be one vast mass of iron.—The mineral products of Mexico, so far as hitherto known, are richer than those of any other country, not excepting Peru; and it is supposed upon good authority that still richer mines of silver and gold are likely to be discov-

ered. The quantity of silver annually extracted is estimated at 500 tons, and that of gold at a ton and a half. Almost one half of the total yield is derived from the three great mining districts of Guanajuato, Zacatecas, and Catorce. In 1803 the shaft of the Valenciana mine, which yields an average annual profit of \$500,000, had reached a depth of 1,670 ft., being the deepest hitherto opened by the hand of man. The value of the precious metals from the Mexican mines, from the conquest down to 1826, was as follows: 1521 to 1803, \$2,027,952,000; 1803 to 1810, \$161,000,000; 1810 to 1826, \$180,000,000; total, \$2,368,952,000. The events of the war of independence constrained many mine owners, mostly creoles, to emigrate; and a number of the most productive mines are still in ruins, notwithstanding the efforts made to reclaim them by foreign capitalists. The whole of the gold and silver extracted from the mines of Mexico up to 1870 is estimated at \$4,200,000,000. The seven principal mines of San Luis Potosi alone produced in 1868 silver to the value of \$2,176,899 26. The state of Sinaloa is said to be literally covered with silver mines, the foreign property in which is distributed as follows: American, \$2,000,000; Spanish, \$1,450,000; English, \$250,000; and German, \$50,000. Mexicans there work so many mines and on so small a scale, that accurate statistics concerning them cannot be obtained. Scientific explorers, who visited the Sinaloa mines in 1872, reported that those on the Pacific slopes would be the great source of the supply of silver for the next century. In 1870 there were in Oajaca 83 silver and 40 gold mines; in Sonora, 144, chiefly yielding gold, besides 583 in which, although very productive, the works were suspended. The mines during the colonial period were crown property, and those who worked them paid one fifth of the product to the king. When Mexico became independent they were declared public property, and miners were required to pay into the national treasury only a small percentage of the yield. Even this tax was afterward abolished, and any one can, by right of discovery, denounce or record a mine, and obtain authority to work a certain number of varas free of tribute. A slight tax is however imposed on melting and coining it, amounting in 1873 to \$166,590 14 for the whole republic. Although the ancient Aztecs do not appear to have possessed regularly stamped coin, their commerce was not exclusively confined to exchange of commodities; they had certain signs of the values of different articles, which consequently took the place of money, and of which Clavigero enumerates five kinds. One of these was cacao beans, counted by *xiquipillis* or lots of 8,000, or by sacks of 24,000 each. For articles of daily necessity the usual money was scraps of cotton cloth called *patolcuachtli*; expensive objects were paid for in grains of gold carried in quills; and for the cheapest arti-

cles copper pieces cut in the shape of a T were used. After the conquest the first mint was established in Mexico in 1538 by Don Antonio de Mendoza, the first viceroy. The coinage of colonial times was distinguished into four subdivisions: *moneda macuquina*, irregular polygonal coin stamped without a machine, and having a cross, two lions, and two columns on one side, and the name of the reigning Spanish sovereign on the other, extending from 1535 to 1731; *moneda columnaria*, or pillar coin, 1732-'71; *moneda de busto*, or bust coin, 1772-1821; and the coinage struck during the war of independence, 1810-'21. Since the establishment of independence there have been two distinct categories, the imperial and the republican. The total issue of macuquina coins was \$760,765,406; pillar coins, \$461,518,225; bust coins, \$929,298,327; total coinage of the colonial period, \$2,151,581,958, of which \$2,121,474,024 was executed at the mint of the capital, and \$30,107,934 (all bust coins) at the mints of Chihuahua, Durango, Guadalajara, Guanajuato, Sombretete, and Zacatecas; \$2,082,322,235 was silver, \$68,716,830 gold, and \$542,893 copper. There were in 1873 eleven mints in the republic: Durango, Guadalajara, Oajaca, Culiacan, Hermosillo, and Alamos, under the direction of the central government, and Mexico, Guanajuato, Zacatecas, San Luis Potosi, and Chihuahua, rented by private individuals; and the aggregate coinage at all of them in the year 1872-'3 was \$20,374,554, of which \$19,686,434 was silver. The total coinage in the Mexican mints from their foundation to June 30, 1873, was as follows:

Colonial period.....	\$2,151,581,958
Period of independence (1821-'73).....	798,773,655
Total.....	\$2,945,855,613

Of the specie coined in 1869-'70 (\$20,677,021), \$17,479,014 was exported, leaving \$3,198,007 for the general circulation.—Tin is abundant in Michoacan, and still more so in Jalisco; copper is common in both these states and in Guanajuato and Mexico; and lead is frequently found in almost all the silver mines, and especially in those of Oajaca. In this last state occur vitriol and amethysts, agates, turquoises, and carnelians, the most remarkable beds of all of which are in Mount Cocola on the confines of Tlaxcala. The *galinazo* stone, a black volcanic product, at times shaded with blue, and susceptible of a high polish, is found in many of the states. Marbles everywhere abound, the green and white varieties of Tecali being very beautiful. Porphyry, jasper, alabaster, rock crystal, talc, various green stones somewhat resembling emeralds, iron and loadstone (the two last particularly in Chihuahua), are met with in many parts of the Sierra Madre. True serpentine is found in Guanajuato, as are also zinc, antimony, and arsenic. Mercury occurs in that state and elsewhere; but this commodity, now so extensively used in the amalgamation process, is mostly imported, and at enhanced

prices. Gypsum and slate are very common; and coal is said to exist at the head waters of the Rio Sabinas. Sulphur abounds in the craters and on the flanks of the volcanoes, as well as in many of the rivers of Jalisco; the coasts of Yucatan afford quantities of amber; and salt is so plentiful in Yucatan, Puebla, Jalisco, and Tamaulipas as to be the object of an extensive export trade. Copperas abounds in Mexico; garnets, found in many parts of the republic, are much esteemed; and Lower California is justly celebrated for the large number and superior quality of its pearls. The fisheries of the *avicula margaritifera* or pearl oyster are carried on along the gulf coasts of the Californian peninsula, and have long been highly productive. In 1873 the value of the shells obtained by 636 divers was \$112,080, and of the pearls \$64,800. Mineral springs are numerous in every part of the table land and on the slopes of the Cordilleras; the most famous are those of El Peñon and Nuestra Señora de Guadalupe, both in the vicinity of the city of Mexico, from the first of which are extracted large quantities of salt; and the thermal springs of Aguas Calientes.—In point of climate, Mexico, in common with all the Andine territories of Spanish America, is divided into three great terraces: the coast regions, or *tierras calientes* (hot lands); the mountain slopes, or *tierras templadas* (temperate lands); and the elevated plateaus, or *tierras frias* (cold lands). The first region comprises all the country lower than 3,000 ft. above the sea; the second extends from 3,000 to the mean elevation of the central table land, 6,000 ft.; and the third embraces all above this last altitude. The climates are distinguished into hot and dry, and hot and moist; temperate and dry, and temperate and moist; and cold and dry, and cold and moist. Properly there are but two seasons in all Mexico: the dry, from October to May; and the rainy, comprising the remaining months. The heaviest rains fall in August and September. The heat is generally excessive on all the coasts, but especially so at Guaymas, Mazatlan, and Acapulco, on the Pacific, and Vera Cruz, Mérida, Sisal, and Progreso, on the gulf. The mean annual temperature at Guaymas is 104° F.; that in all the *tierras calientes* is from 75° to 85°; in the *tierras templadas*, from 65° to 72°; and in the so-called cold regions, from 55° to 60° in the dry season, and never rising higher than 80° in the wet. The healthiest localities are those enjoying a dry climate, whether hot, temperate, or cold; and the most unhealthy, those in whose climate humidity prevails. The extreme rarefaction of the atmosphere in the highlands renders acute lung diseases common, and particularly pneumonia; and disorders of the digestive organs are likewise frequent and fatal. Yellow fever and black vomit, the great scourges of the coast regions, usually set in at Vera Cruz about the end of May, and last till November. At Campeachy, Tampico, and

Acapulco the season often passes without a single case, intervals of six or even eight years sometimes occurring between the visitations at the last named port. But no such respite is ever enjoyed at Vera Cruz, Mérida, or any of the coast towns of Yucatan, at all of which the mortality is generally very great.—The soil of Mexico is for the most part extremely fertile. The comparatively few exceptions are nearly all attributable to insufficient irrigation. Artificial irrigation is secured by means of canals and *aguajes* or dams. The value of the landed property of Mexico is set down as follows in an official report for the year 1873: municipal, \$147,819,162 20; rural, \$174,641,176 31; total, \$340,791,403 17. The minister of finance remarks, however, that triple that amount (\$1,022,374,209 54) would more nearly approximate the truth. The magnificent arboreal vegetation embraces 114 different species of building timber and cabinet woods, including oaks, pines, firs, cedars, mahogany, rosewood, &c.; 12 species of dye woods; 8 of gum trees; the *caucho* or India rubber, copal, liquidambar, camphor, turpentine pine, mezquite (yielding a substance similar to gum arabic), dragon tree, and the *almédigo* or *callitris quadrivalvis*, from which sandarach is extracted. Among the oil-bearing trees and plants, of which there are 17 varieties, are the olive, cocoa palm, almond, sesame, flax, the tree yielding the balsam of Peru, &c. The maguey plant furnishes the natives with wholesome beverages, and in some instances also food, while the fibre is an excellent substitute for hemp. The fermented juice, called *pulque*, is the favorite beverage of the Indians, and is much liked by many of the whites; and a sort of brandy, *mezcal*, also prepared from it, is highly intoxicating. The value of the trade in pulque for 1862 was reported at \$1,487,523, and in mezcal at \$2,576,646; but both have considerably increased with the facilities for rapid transport afforded by the Mexico and Vera Cruz railway opened in 1873. A special train called the "pulque train" runs every day between the capital and Sultepec. There are 59 classified species of medicinal plants; and many more are mentioned by botanists as still unclassified by science. Jalap is exported to the extent of \$50,000 per annum; the United States alone took \$10,000 worth in 1873. The annual export of jalap at the beginning of the present century was 170,000,000 lbs. Every variety of edible fruit known in Europe or America is found in Mexico, almost all growing spontaneously; and owing to the peculiar structure of the country, all of them, as well as every kind of European garden vegetable, may be obtained in the markets of the capital throughout the year. Agriculture is assiduously but laboriously carried on by the natives, who persist in using the implements of their ancestors, to the almost absolute exclusion of efficient modern appliances. One of the chief cultivated products is maize,

of which three and even four abundant crops are obtained annually in many districts, and which thrives in all parts of the country. The yield is often 500 fold; and the Indians make it, with beans and chilli, their almost exclusive food. Wheat gives an increase of 60 fold, and rice of about 45. Several varieties of beans are grown; also barley, rye, lentils, potatoes, sweet potatoes, peas, cumin and coriander seeds, &c. Cotton, coffee, cacao, the sugar cane, tobacco, indigo, and cochineal are the staple productions of the hot and temperate regions. The cotton crop of 1873 in Sinaloa comprised 550,000 lbs. at an average price of 20 cents; the cotton district of San Juan Evangelista produced 1,842,104 lbs. in 1872. The coffee of Colima, with an annual yield of about 30,000 lbs., is reported equal in quality to the finest Mocha. That of Vera Cruz (Jalapa and Cordova) is likewise much esteemed; the shipments of it to the United States in 1873 amounted to \$299,942. The great cacao centre is Oajaca, where its three yearly crops render its culture the most profitable in the state. Sugar is made in large quantities in Vera Cruz and elsewhere. The tobaccos of Tabasco and Vera Cruz are quite equal to the finest of Cuba. The annual value of the food crops of Mexico may be estimated at about \$58,000,000, and of all agricultural productions at \$110,000,000. The flowers of Mexico are among the richest and most varied in the world; and several of the streets of the capital on Sunday mornings are literally enamelled with flowers of brilliant hue and fragrant odor. Grapes flourish in Coahuila, Nuevo Leon, and Aguas Calientes, where, as in Sinaloa, wines, brandy, sugar, and raisins are made from them.—The manufactures of Mexico are comparatively unimportant. Except those of tobacco, cacao, sugar, and indigo, none are exported, and but few can fully meet the home demand. Very good woollen and cotton cloths are woven in Durango, Guanajuato, Jalisco, Nuevo Leon, Mexico, Puebla, and Vera Cruz, and the *rebozos* (a species of shawl) of silk and linen, and the harness and saddles, are unequalled in any of the other Spanish-American countries. Sugar is manufactured largely and of good quality, the state of Morelos alone frequently furnishing 50,000,000 lbs. yearly. There are paper mills in Guadalajara and elsewhere. Glassware, porcelain, and earthenware of superior quality are made; also hats, chocolate, laces, flowers, liquors, gunpowder, &c.; and there are iron foundries and flour mills in many of the states. The silver and goldsmiths excel in the execution of filigree ornaments; and the Indians of Mexico, Guanajuato, and Guadalajara are skilful in the manufacture of clay and rag figures, almost worthy to rank with works of sculpture. The figures represent muleteers, water carriers, soldiers, and such like, with perfect accuracy of costume, and sometimes portraits from life, or from photographic pictures. Beer and pale ale

of excellent quality are made in several breweries in the capital. The *dulces* or sweetmeats of Guadalajara are much sought after both in and out of the republic.—The fauna includes three species of large *felidae*, the puma or American lion, jaguar, and ocelot; among the smaller is the wild cat. Wolves are common in the northern states, and also the *coyote* or coyote; besides which there are bears, wild boars, and bison. A species of sloth is found in the southern forests, with five varieties of monkeys. Of the other wild animals the principal are hares, rabbits, squirrels, two or three kinds of deer, beavers, moles, martens, and otters. All the domestic animals introduced by the early Spanish settlers have multiplied prodigiously. The horses, though small, retain the spirit and graceful forms of the Andalusian stock from which they mainly sprang. The rivers and lakes abound in excellent fish; turtles are taken in considerable numbers on the coast, and the *carey* of Yucatan and Guerrero is the object of a trade valued at \$20,000 yearly. The ophidians are represented by a few boas in the southern forests, and several species of snakes, some extremely venomous, as the rattle and coral snakes. The largest lizard is the iguana, whose flesh is by some of the natives considered excellent food. Noxious insects infest the hot regions in myriads; *alacranes* or scorpions, in two distinct varieties, are everywhere feared, and it is said that many children are killed every year by their sting; and scolopendras, gigantic spiders, tarantulas, and mosquitoes abound. Bees are numerous, and their wax is an article of export; and the silkworm, though comparatively neglected, is said to yield an annual profit of \$40,000. The birds of prey are eagles, hawks, and *zopilotes* or turkey buzzards, the scavengers of the coast towns, with three or four species of owls. Domestic fowl are extremely abundant. The parrots, humming birds, trogons, &c., vie in richness of plumage with those of Brazil; and the Mexican songsters, the prince of which is the *zenzontle* or mocking bird, are unequalled by those of any other country.—The population comprises about 6,000,000 Indians of unmixed blood, nearly one half of whom are nomadic savage tribes of the mountainous districts of the north; about 500,000 whites or creoles, chiefly descended from the early Spanish colonists; perhaps 25,000 Africans or hybrids possessing some negro blood, whether mixed with the European or the Indian element; and mestizos or half-breeds derived from the union of the whites and Indians. Of the Indians there are 35 tribes, speaking as many different tongues and nearly 150 dialects. They are indolent and apathetic, but under prudent direction become good workmen, and often attain to excellence in the mechanic arts; and many of them have been closely connected with the leading political events of the country. The mestizos inherit the vices rather than the virtues of the parent stocks, are

inconstant and turbulent, and, if not the promoters, have been the instruments in many civil wars. The creoles or white Mexicans are in general arrogant, proud, indolent, and reckless, but extremely courteous and hospitable. The men are often well informed, but the education of the women rarely extends beyond reading and writing and a knowledge of music. The national costume of the *ranchero* or planter is a close-fitting jacket and slashed trousers adorned with massive gold or silver lace and buttons, and so wide below as to almost cover his immense spurs with rows two or three inches in diameter. Some of the women still retain the old Castilian black silk dress; but French fashions prevail among the higher classes.—The staple articles of export are silver and gold coin, silver and copper ores, cochineal and indigo and other dye stuffs, with timber, cabinet woods, Sisal hemp, ixtle, &c. The imports are cotton, linen, woollen, and silk fabrics, wrought and unwrought iron, machinery, hardware, provisions, &c. The value of the exports to the United States from Vera Cruz in 1873 was \$872,616; to Great Britain from the whole country in 1872, \$2,217,620. The whole foreign trade of the republic in 1873 was: exports, \$25,500,000; imports, \$28,000,000. The annexed table shows the relative proportion of imports from different countries:

COUNTRIES.	Value.	COUNTRIES.	Value.
Great Britain...	\$18,000,000	Italy.....	200,000
United States...	5,000,000	Ecuador.....	150,000
France.....	5,000,000	Guatemala....	50,000
Germany.....	2,000,000	Colombia.....	40,000
Spain.....	1,500,000	Chili.....	40,000
Cuba.....	1,500,000	Venezuela....	30,000
China.....	1,000,000		
Belgium.....	500,000	Total.....	\$30,010,000

Systematic smuggling is so prevalent that the official figures representing the imports of all kinds and the exports for bullion may safely be doubled. The duties collected in the year ending June 30, 1870, amounted to \$17,303,945 24, of which \$8,274,572 were received at maritime, and \$9,029,373 24 at frontier custom houses. According to the latest official report, published in November, 1873, the shipping movements at all the ports of the republic in 1870 were as follows:

ENTERED.			CLEARED.		
FLAG.	Vessels.	Tons.	FLAG.	Vessels.	Tons.
Mexican....	2,155	108,641	Mexican....	2,149	100,008
British.....	163	73,461	British.....	177	84,514
Spanish.....	45	11,494	Spanish.....	42	7,898
French.....	116	47,685	French.....	110	48,073
Prussian.....	62	18,224	Prussian.....	66	19,959
United States	323	386,176	Un'd States	327	378,710
Dutch.....	19	4,157	Dutch.....	22	8,959
Norwegian...	23	7,805	Norwegian...	23	6,894
Danish.....	16	3,926	Danish.....	13	8,571
Others.....	21	5,492	Others.....	21	5,965
Total.....	2,950	669,061	Total.....	2,941	659,551

Of the number of vessels entered, 362 were steamers, and of those cleared, 378. One French and two British lines of steamers ply regularly between St. Nazaire, Southampton, and Liverpool and the gulf ports of Vera Cruz and Tampico, touching at Havana, St. Thomas, Martinique, and Santander. The British steamers frequently call at New Orleans. An American line between New York and the principal gulf ports every 20 days, calling at Havana and New Orleans, receives a subsidy of \$2,200 per round trip from the Mexican government. Regular communication is kept up between Acapulco and Panama and the intermediate ports of Mexico and Central America, and between Acapulco and San Francisco and the intermediate ports of Manzanillo, Mazatlan, and Cape San Lucas, by two American lines, one of which has a subsidy of \$2,500 per round trip, and the other \$2,000 monthly, from the Mexican government. In 1872 there were 5,740 arrivals at and 5,095 departures from Mexican ports. The Mexican merchant navy comprises 1,029 craft of all sizes, 357 of which are sea-going or large coasting vessels.—The existing railways of the republic are as follows:

Mexico to Vera Cruz.....	268½ m.
Branch, Apizaco to Puebla.....	29½ "
Mexico to Talpam.....	15½ "
Vera Cruz (La Zamorana) to Medellin.....	11 "
Mexico to Guadalupe.....	4½ "
*Mexico to Tacubaya and Popotla.....	8½ "
*Mexico to Atzacapozalco.....	6½ "
*Vera Cruz to Puebla <i>via</i> Jalapa.....	25 "
Total.....	363½ m.

The line from Mexico to Vera Cruz is one of the most wonderful engineering enterprises in the world. It was commenced in 1852, completed in December, 1872, at a cost of \$27,000,000, and opened to public traffic through its whole extent on Jan. 17, 1873. About 60 m. of the line extend over the mountain region between the coast and the great Mexican plateau, the elevation of which on the eastern border is nearly 8,000 ft. above the sea. This portion of the road, with an average grade of 2·51 in 100, or 133½ ft. to the mile, carried along the flanks of lofty mountains, through long tunnels, and over bridges spanning deep ravines, affords an opportunity of surveying the grandest and most picturesque scenery on the North American continent. The traffic amounts to about 240,000 passengers and 184,000 tons of freight per annum; the receipts are about \$2,500,000, and the running expenses average 60 per cent. of the receipts. The line between Mexico and Atzacapozalco is to be extended to Cuantitlan and Toluca. There is a line of horse cars from Matamoros to Paso de Santa Cruz. Several other lines are projected, the most important of which is one from Mexico N. to El Paso, to communicate with the United States railway system. There are 24 regular lines of diligences established between the principal towns of the republic.

* Horse cars.

† Completed to Toluca.

The lack of good roads, in a country whose topographical structure deprives it of navigable rivers, greatly retards its material development and prosperity. Large sums were appropriated in 1873 for new highways and for repairs on such as already exist. A network of telegraph wires, 4,345 m. in length in 1874, embraced all the states but Chihuahua, Sonora, and Chiapas, and 655 m. more were in process of construction. The central government owns 1,575 m. of the lines, and state governments 605 m. There are lotteries under the direction of the government, and paying 10 per cent. of the proceeds into the national treasury.—Mexico has a federal government, based upon the constitution of 1857, and strongly resembling that of the United States. The executive power is vested in a president elected by universal suffrage for four years, having a salary of \$30,000, and aided in the administration by a council or cabinet consisting of the ministers of the interior (*gobernacion*), foreign affairs, justice, public worship and public instruction, public works (*fomento*), finance, and war. These ministers are appointed by the president. The chief justice of the supreme court unites with his judicial functions those of vice president of the republic. The legislative power resides in a congress, consisting of a lower house, the members of which are elected by universal suffrage for two years, each state being represented in the proportion of one member for every 80,000 inhabitants; and a senate with two members for each state, elected by a plurality of votes in the congress of their respective states, and who must have completed 30 years of age. The congress is by law required to sit from Jan. 1 to April 15 in each year; and a *consejo de gobierno* or government council holds sessions during the recess of congress. The predominant religion is the Roman Catholic; but all other sects are tolerated, by virtue of a law promulgated in 1873. The ecclesiastical hierarchy consists of three archbishops, of Mexico, Guadalajara, and Michoacan; and ten bishops, of Puebla, Nuevo Leon, Oajaca, Durango, Yucatan, Chiapas, Lower California, Sonora, San Luis Potosi, and Vera Cruz. The revenue is mainly derived from customs, as will be seen by the following table for the years 1871-'2 and 1872-'3:

REVENUE.	1871-'2.	1872-'3.
Customs receipts.....	\$9,265,699 68	\$9,076,709 74
Divers contri- butions..... } Fed. Customs..... } district.	1,192,796 78 488,016 45	1,741,622 91 471,228 75
Stamped paper.....	2,217,274 60	1,734,394 54
Nationalized property.....	895,261 65	505,438 88
Mint.....	259,431 58	159,454 13
Public instruction fund...	75,050 36	65,864 11
Carriage tax.....	10,235 79	7,075 68
Post office.....	474,519 10	265,440 22
Sundries.....	617,445 81	284,586 27
Arrears.....	47,694 87	22,078 27
Totals.....	\$15,046,756 67	\$14,388,926 50

The expenditures were as follows:

EXPENDITURES.	1871-'2.	1872-'3.
Legislative.....	\$630,195 82	\$964,912 32
Executive.....	28,088 70	41,965 23
Supreme court.....	41,754 37	63,905 98
Circuit courts.....	27,942 10	39,843 63
District ".....	105,443 82	135,549 30
Ministry of foreign relations.....	110,810 49	137,675 93
Ministry of the interior.....	1,859,220 67	1,823,429 77
" of justice.....	567,105 12	778,875 30
" of finance.....	1,963,947 01	2,389,581 48
" of war and navy.....	7,624,282 82	7,427,891 60
" of public works.....	1,719,418 76	1,243,628 71
Public debt.....	275,188 27	432,894 16
Balance from preceding year.....	218,248 87	254,969 73
Reserve fund.....	79,600 80	1,136,894 13
Provisional branches.....	2,450,029 51	3,648,176 20
Sundries.....	1,054,538 88	909,647 42
Totals.....	\$18,246,714 51	\$20,989,363 89

There is no official report of the national debt. The loans contracted by the imperial government are in their entirety repudiated by the present government. The army comprises 22,387 men, viz.: 15,407 foot, 5,140 horse, 1,463 artillery, and 377 coast guards and invalids. The estimated total expenditure for the army department in 1872-'3 was \$10,252,522 32, which would include an extraordinary appropriation of \$2,628,239 50.—Public instruction is in a comparatively prosperous condition; the number of schools is steadily increasing, through the liberal appropriations of the central and the various state governments for the development of the system, and the cooperation of private individuals. The following institutes in the city of Mexico are supported by the central government: an advanced school for girls, preparatory school, and schools of law, medicine, agriculture, engineering, fine arts, commerce, and arts and trades; besides which there were in 1873 in the whole federal district 338 schools of all grades, 103 being for females, and the total attendance being 22,407, of whom 8,773 are females. Among these schools were 12 under the jurisdiction of the Lancasterian company, 6 under that of the benevolent society, the schools of the founding hospital and other charitable institutions, private schools to the number of 100, and three for adults, with 248 pupils, 148 of whom were females. In the other states there were 3,532 public schools, of which 3,498 were male primary and 29 male grammar schools; the total attendance at all of them was 165,864, of whom 19,594 were females. The number of public schools for adults was 23, with 935 male and 76 female pupils; and that of the literary institutes 15, with 2,493 students.—The history of Mexico may properly be distinguished into ancient and modern; and the latter is subdivided into two periods, the colonial and that of independence. Notwithstanding the numerous theories advanced concerning the primitive inhabitants of the country, all is still wrapped in profound obscurity. Tradition and the existing remnants of ancient structures point to a more remote and perhaps

a higher civilization than that which filled the early Spanish conquerors with admiration; but neither can assist in determining the name or the origin of the first immigrants. Historic ground in Mexico is not reached until the end of the 6th century; all beyond belongs to the domain of mythology. The Toltecs came to the valley of Mexico, and there built their capital, Tollan (Tula), toward the beginning of the 7th century. According to one theory, they came from Guatemala; another theory represents them as crossing from Asia to America, by a chain of islands which in remote ages stretched at the north from the shores of the eastern to those of the western continent. They are described as an agricultural people, clothed in long tunics, sandals, and straw hats; not very warlike, but humane and civilized, and proficient in the highest mechanical arts; erecting cyclopean edifices; having a worship not sanguinary; and inventing the system of astronomy afterward adopted by the Tezucans and Mexicans. The first Toltec dynasty is said to have been founded early in the 8th century by Icoatzin. After a lapse of about 500 years, the kingdom of Tollan, reduced by civil strife, pestilence, and famine, was divided, and many of the surviving inhabitants migrated southward. The Toltecs were the first tribe to leave a written account of their nationality and polity; they are regarded in Mexican history as the primitive nation of the country, and their epoch is taken as the starting point of a fixed chronology for the native annals. With the downfall of their monarchy terminated the civilization of the north. Not long afterward the Chichimecs, described as a fierce northern tribe, living by the chase, dwelling in caverns or straw huts, monogamous, and worshipping the sun as their father and the earth as their mother, came to the Toltec country, which they did not conquer, as they met with no resistance, but merely occupied peacefully, settling in the same towns with the Toltecs who remained from the general emigration. The descendants of these Toltecs became once more numerous and prosperous, and, taking the name of Colhuís or Culhuas, founded Colhuacan on the margin of the lake. Between the arrival of the Chichimecs and the end of the 12th century, tradition mentions the influx of a multitude of other northern tribes, chief among whom were the Tepanecs, who, with Atzacozalco as their capital, established an independent state, and became gradually so powerful that in later times two of their kings usurped the throne of Tezcuco. Another of these tribes were the Techichimecs, the founders of the Tlaxcalan republic; and all of them spoke the Nahoá or Nahuatl tongue. After these came the Acolhuís, likewise of Nahoá origin, and consequently kindred to the Toltecs, and especially distinguished among all the immigrants by the Chichimecs as being the most refined. From them the latter readily learned agriculture, the mechanic arts, and town

life; and the two races became so completely intermingled as at last to be confounded in one great nation in the kingdom of Tezcuco or Acolhuacan, a name indicating that not only the customs and culture of the Acolhuís prevailed, but also their language, which was incomparably more perfect than the Chichimecan. The most important of all the tribes, the Mexicans or Aztecs, although the last to choose a permanent resting place, had been as long in the valley as any of the sister nations. They proceeded from Aztlan, an unknown region of the north, and reached Anáhuac about 1195, having made three stations, at which the ruins of *casas grandes* are still to be seen. (See *CASAS GRANDES*.) Their first halting place was on the shores of the lake of Teguayo or Teguayo, probably identical with the lake of Timpanogos, or Great Salt lake, in Utah; the second was on the river Gila, and the third not far from the Presidio de los Llanos. After reaching the plain of the lakes, the Mexicans led a nomadic existence for 180 years. After a series of unsuccessful encounters, in which their numbers were greatly diminished, they laid on the islands of the lake the foundations of their city of Tenochtitlan in 1325. Reduced to extreme poverty, and hated by surrounding nations, they resolutely strove against ill fortune until they became numerous and powerful enough to take the offensive. They then spread desolation and slavery through many of the tribes who in former days had shown them little mercy. Their capital was extended, and beautified to an extraordinary degree; they soon became the equals of the Tezucans in the cultivation of the arts and sciences; their institutions, customs, theogony, and even their language, were propagated wherever their power reached. The adjacent territories were invaded and occupied by Aztec garrisons. The Tezucans were perhaps more advanced in knowledge and refinement than the Mexicans; but the latter were certainly far more powerful, and they gave their name to the whole country and to the civilization of their day. The boundaries of the Aztec realm have never been precisely defined; but they extended northward to the country of the Huastecas, whom the Mexicans never subdued; to the northwest the empire did not reach beyond the province of Tulba, the vast tract of land beyond which was occupied by the Otomies and some Chichimec tribes; to the west it terminated at the frontier of Michoacan; on the southwest it was in general only limited by the Pacific; and the greatest length on that coast was from Xococoncho (Soconusco) to Coliman. On the Atlantic side the Mexicans possessed all that lay W. of the Coatzacoalcos. The Acolhuán dominions did not form one eighth of the Aztec kingdom. It should be observed that Ahuizotl, whose reign immediately preceded the Spanish conquest, carried his arms successfully into Guatemala, subduing that country and a portion of Nicaragua. The

Tepanecs in 1419 seized the Acolhuan capital, assassinated the king, and placed their own prince Tegozmoc upon the throne, which was transmitted to his son Moxtila. But Nezahualcoyotl, the rightful heir, succeeded with the aid of the Mexicans not only in driving out the Tepanecs, but in conquering their country, which they gave to their allies the Mexicans. A league of mutual support and defence was then entered into by the princes of Mexico, Tezcuco, and Tlacopan, the conquered countries to be divided between the confederates, and the largest share to be awarded to Mexico. During a century of constant warfare this pact was adhered to with the strictest fidelity. The Mexican monarch had the predominance in matters of war; the authority of the three was equal in all other concerns; and no one ever meddled with the government of the others. Toward the middle of the 15th century, when the Acolhuan power began to decline, the Mexican king plundered a portion of his neighbor's territory, and arrogated to himself the title of emperor, though the Tezcuacan sovereigns continued to reign until the time of the conquest. These last had the prerogative of crowning those of Mexico.—For the first 27 years after the foundation of Tenochtitlan, the government was in the hands of a body of 20 nobles; but in 1352 it was transformed into an elective monarchy, Acamapitzin or Acamapichtle being the first king. In the beginning the power of the sovereigns was limited, and their prerogatives were very moderate; but with territorial extension and increased wealth came the introduction of court pomp and pageantry, and such despotism as characterized the reign of Montezuma I. After the election of a king, four princes or lords were chosen from among his nearest of kin, whose voice was indispensable in all state affairs; they acted as senators, were presidents of the royal council, and one of their number was in due time elected successor to the crown, with sole reference to fitness for the office. In later times it was customary to appoint the four candidates to the government of minor states; the one elected must have been general in the army, and not under 30 years of age. When the successor was under age, the government during his minority was committed to the senior of the royal family most fitted for the charge, whose election was confirmed by the kings of Tezcuco and Tlacopan. Three councils or cabinets assisted the king in the administration: one for the revenue, another for war, and a third for the government of the provinces. The councillors or ministers, though necessarily of the nobility, owed their eligibility to long military service and a profound knowledge of state matters. The nobles and priests were the main supporters of the national interests; but the influence of the latter in public affairs was more limited than in some of the earlier monarchies. They had no seat in the privy council, and their functions were

chiefly restricted to superstitious exercises and foretelling the issue of campaigns. But they were intrusted with the education of children, were consulted on all grave family concerns, and their social influence was almost unbounded. Profound respect for the main principles of morality was evinced by the ancient Mexicans, with whom the security rather of person than of property was largely provided for. In the uninhabited districts of the kingdom, public inns were placed at intervals for the gratuitous accommodation of wayfarers, and boats or bridges for their convenience in crossing rivers; and when the roads were damaged by floods, they were repaired at the public expense. A complete system of supreme and subordinate tribunals existed in all the towns, and a still more perfect judicial organization in the neighboring kingdom of Acolhuacan, where a council of all the judges throughout the realm was held once in 80 days at the capital, the monarch in person presiding, for the adjudication of causes left undetermined by the lower courts. The Aztecs were as remarkable for the moderation of their civil as for the severity of their penal code; but their laws seem to have been administered less impartially than in Tezcuco, and to have been somewhat flexible for the nobles and priests. Creditors could imprison their debtors, and had a claim upon their inheritance, but could not enslave the widows or orphans; and slaves about to be sold might free themselves by taking refuge in the royal palace. Adultery was punished with death, however noble the offender might be. For treason or any crime against the person of the monarch, embezzlement of the taxes, &c., the offender was put to death with all his kindred to the fourth degree. Murder, even of a slave, was always a capital crime. Drunkenness in youth was a capital offence; in persons of maturer years, though not capital, it was punished with severity; but men of 70 years, and all persons on festive occasions, were permitted the use of wine. He who lied to the prejudice of another had a portion of his lips cut off, and sometimes his ears. Finally, he who robbed in the market, altered the lawful measures, or removed the legal boundaries in the fields, was immediately put to death; and conspirators against the prince, and those who committed adultery with the prince's wife, were torn to pieces limb by limb. The murder of a merchant or an ambassador, or any injury or insult to the latter, was considered a sufficient cause of war. During a series of very cruel wars, all prisoners were devoured or enslaved. At one time the laws were so few that the people knew them all by heart. They were represented by paintings; and the judges were attended by clever clerks, or painters, who by means of figures described the suits and the parties concerned therein. The Mexicans had two sorts of prisons, one for debtors and persons not guilty of capital crimes, the other a species of cage in

which were confined condemned criminals and prisoners taken in war, both of whom were closely guarded, those doomed to capital punishment being sparingly fed, and the others abundantly nourished that they might be in good flesh when led to sacrifice. For the same reason the Mexicans in battle preferred to capture their enemies alive. Polygamy was permitted, but seldom practised save by the princes and nobles. Marriage generally required the consent of the parents of both parties; and there was a special court for divorces, in which a wife might sue. Filial affection was a characteristic virtue of the Aztecs. Except in the royal family, sons succeeded to all the rights of their fathers; if these died without male issue, their rights reverted to their brothers, and in the absence of the latter to their nephews. Daughters could not inherit. The government revenues were derived from crown lands set apart in the various provinces, from a tax on the agricultural products, and chiefly from a tribute consisting of provisions and manufactured articles; besides which a contribution was received from the merchants and craftsmen every 20 or 80 days. The profession of arms was one of the most esteemed, and those who died in defence of their country were regarded as the happiest. There were four distinct grades of generals, and next below them were captains. The main bodies or regiments consisted of 8,000 men, and seem to have been divided into battalions of 400 men each, and these into squads of 20. They marched in admirable order; the priests were always in front; and the signal for combat was given by kindling a fire and sounding a trumpet. Their tactics were unfavorable to hostilities by night; but "force and stratagem, courage and deceit," says Prescott, "were equally admissible in war."—The Aztecs were most sincere in the practice of their religious rites. They believed in a supreme creator, invisible yet omnipresent, but requiring numerous assistants to perform his will, each of whom presided over some special natural phenomenon or phase of human existence. They had 13 principal and several hundred inferior deities. The dread Huitzilopochtli, the war god of the Aztecs, was the patron divinity of the race, and myriads of human victims were sacrificed to him yearly in countless pyramidal temples throughout the realm. Quetzalcoatl, a more beneficent deity, was described by the natives as a tall white man, with a large forehead and flowing beard, who taught his favored people the art of government and the various arts of peace, especially those of the husbandman and silversmith; forbade bloody sacrifices, and only permitted those of bread, roses, and perfumes; and warned against robbery and all violence. This "god of the air," as he was named, having incurred the displeasure of one of the other chief deities, was compelled to leave the country; but on quitting the shores of the gulf he promised to return, and the Mexicans always

looked forward to that auspicious day. After his departure from the capital, he tarried at Cholula, where a magnificent temple was dedicated to him, the ruins of which are among the most curious remains of Mexican antiquities. All these divinities were represented by images of clay, wood, stone, or precious metals and gems, but of most fantastic forms, coarse and hideous; and of the minor gods of every degree hosts of images were to be found in the dwellings of both great and small. The Mexicans, with all the other polished natives of Anáhuac, regarded the soul both of man and brutes as immortal. The number of priests corresponded with the multitude of gods and temples; ancient historians affirm that 5,000 were attached to the great temple of the capital, on the site of which now stands the cathedral. There were several different orders among the priests, the chief of all being the two high priests, whose dignity was conferred by election. The high priests anointed the king, and were the oracles consulted by him on all important state concerns. The sacerdotal hierarchies of the several gods were quite separate, and had each a gradation of their own. The temples (*teocallis*) were of two kinds; low and circular, or high and pyramidal, on the tops of which the sacrifices took place. Torquemada estimates that there were upward of 40,000 throughout the empire, and other historians estimate their number much higher. There were hundreds in each principal city, besides the great temple with several smaller ones within its precincts; in each outlying quarter of the city were other small courts with as many as six temples; and there were temples on the mountains and at intervals along the highroads. They were solid pyramidal masses of earth cased with brick or stone, many of them more than 100 ft. square and of a still greater height. The ascent was by flights of steps on the outside, and on the broad flat summit were sanctuaries containing the images of the deities and altars on which fires were continually burning. Human sacrifices, which they made on the most trivial occasions, formed the chief religious ceremony of the Mexicans and the most important duty of the priesthood. In later days the repetition of these sacrifices became mournfully frequent; some Franciscan monks computed that about 2,500 persons were annually slaughtered on the altars of Tenochtitlan and some of the adjacent towns; and "days had been observed," writes Herrera, "on which above 20,000 had thus perished, reckoning all the sacrifices in several parts." Within the temples were schools, colleges, and apartments for the priests. A few of the priestesses took vows of perpetual celibacy. Some of the priests were permitted to marry; those of whom chastity was required were punished with death for the slightest deviation from it. When a child of two years was dedicated to Quetzalcoatl, a priest with a knife made a slight cut on its breast, to confirm the dedication.

—Piercing the lips and nose for the insertion of various ornaments, and plucking the hairs of the nascent beard, were common practices among the Mexicans. For purposes of record and communication they had a species of picture writing bearing some relation to the Egyptian hieroglyphics. (See *HIEROGLYPHICS*.) They had five books written in this way: the first treating of the seasons and years; the second of the days and festivals throughout the year; the third of dreams, omens, and other superstitious observances; the fourth of baptism and the names of children (for they celebrated a baptismal ceremony much like the Christian rite, in which the infant's lips and breasts were sprinkled with water); and the fifth of the ceremonies and prognostications used at marriages. Historical knowledge was preserved by tradition aided by picture writings; and there were, besides the multitudes of regular chronicles, certain men who kept important events, genealogies, &c., in their memory, and recited them when called upon. Translations of elaborate prose productions seem to show that eloquence and rhetorical effect were aimed at by Aztec scholars; but no original compositions have been preserved. Songs perpetuating their traditions, recited at the great festivals, formed one of the foremost branches of temple education. Their musical instruments included various kinds of trumpets, whistles of bone and clay, horns of large sea shells, bamboo flutes, many varieties of drums, and a few stringed instruments. Theatrical performances were given on open terraces in the market places, the stage being covered with branches of trees; masks were indispensable; and the performances were inseparably connected with the religion. The plays were partly pantomimic and partly recitative. The art of prestidigitation was highly developed. Farces and masquerades were frequently given at the temples by the merchants, disguised as frogs, beetles, birds, butterflies, &c., the entertainment ending with dancing. The Mexicans had a simple system of arithmetical notation, in which the first 20 numbers were expressed by a corresponding number of dots. The number 20 was expressed by a flag, and larger sums were reckoned by twenties and expressed by repeating the number of flags. The square of 20, 400, was denoted by a plume; and 8,000, the cube of 20, by a purse or sack. The year was divided into 18 months of 20 days each, and both months and days were expressed by peculiar hieroglyphics. Five complementary days were added to make up the 365; and for the fraction over of nearly 6 hours, required to make the full year, they added 13 days at the end of every 52 years or cycle, which they called *xihmolpilli*, "the tying up of years." A month was divided into 4 weeks of 5 days each. The epoch from which the Mexicans computed their chronology corresponded with the year 1091 of the Christian era. They had no astronomical in-

struments except the dial, but their skill in the science of astronomy is shown by their knowledge of the true length of the year, of the cause of eclipses and of the periods of the solstices and equinoxes, and of the transit of the sun across the zenith of Mexico. Most of their astronomical knowledge was derived from the Toltecs. The physicians were skilful; they had knowledge of several thousand plants and of hundreds of species of birds, quadrupeds, fishes, insects, reptiles, and minerals; but they mystified their cures with superstitious ceremonies. The Spanish conquerors attest the dexterity and success of the native surgeons in dressing wounds and in blood-letting. The merchants and military officers had a fair notion of geography; maps and charts of certain regions, of rivers, and of the whole coast, were accurately drawn or painted on cloth. Agriculture was in tolerable advancement, the want of ploughs, oxen, and other animals being supplied by simple instruments and assiduous labor. Irrigation by means of canals was very efficient. Of the various Mexican implements, almost the only ones described are an axe of copper or bronze, with just the amount of tin alloy to give it the greatest hardness attainable, and knives and swords, razors, and arrow and spear heads, of *itztli*, or obsidian. They were extremely skilful in the cultivation of gardens, in which they planted fruit trees, medicinal plants, and flowers, with much taste. Among their chief productions were maize, cotton, cacao, the magney or aloe, chile, &c. The magney alone furnished the poor with almost all the necessities of life: paper, thread, needles, cloth, shoes, stockings, and cordage from the leaves, the thickest part of these with the trunk furnishing besides a substantial dish; and *pulque* and *mezcal* from the fermented juice. From the juice of the maize stalk they prepared sugar; from the cacao they made chocolate (Aztec, *chocolatl*), which they formed into tablets. In mining and metallurgy they were very expert. They exercised the arts of casting, engraving, chasing, and carving in metal, with great skill; and in looms of simple construction they made *manta* (cotton cloth) and other tissues, some of which were of exquisite fineness, interwoven with rabbit hair and feathers, their only substitutes for wool and silk, and painted or dyed in most gorgeous colors. With the feathers of birds tastefully disposed on fine cotton webs, they made garments of the utmost magnificence. Buying and selling, there being no shops, were carried on in public squares or market places. Earthenware of every description, and suited for every domestic use, was one of the chief Mexican industries; and many of the articles were painted in showy colors and designs. No beasts of burden were used, all carrying being done either by water, chiefly on the lakes, where a marvellous number of vessels were employed, or on men's backs. The maritime commerce was probably very trifling. For

the rapid transmission of news, towers were erected at intervals of six miles along the high roads, where couriers were always in waiting for despatches, which were transferred from hand to hand at each stage. Despatches were thus carried 300 miles in a day. The different trades were commonly grouped into a species of guild. The women shared equally with the men as well in social festivities as in labor. The Mexicans were simple in dress, but given to an inordinate display of ornaments. The people were courteous and polished, and strict observers of the proprieties of life. Cowering was their posture of respect. In their banquets, which were frequent and costly, human flesh was often served as a special delicacy, particularly in feasts connected with their religion.—The first European to visit the shores of Mexico was Francisco Fernandez de Cordova in 1517; but he only discovered the coast of Yucatan. The discovery was continued in the following year by Juan de Grijalva, in command of a squadron sent from Cuba by Velazquez, who sailed round the north coast as far as the mouth of the river Pánuco, and landed on the islet on which now stands the castle of San Juan de Ulua. After his return, his brilliant account of his discovery excited the desire of conquest. On Good Friday, April 22, 1519, Hernan Cortes landed at that part of the coast where Vera Cruz was afterward built, and founded a town, to which he gave the name of Villarica de Vera Cruz. On the very day of his landing occurred the first of a series of battles which only terminated with the taking of the city of Tenochtitlan, Aug. 13, 1521, and the capture of the young and valorous Guatemozin, the last of the Aztec monarchs. (See CORTES, GUATEMOZIN, and MONTEZUMA.) The other smaller states were subdued after a short resistance. A military government was immediately established, Cortes taking the supreme command; but ayuntamientos had already been formed, the first at Villarica, and these continued independently of the new military power. Many of the laws emanating from the ayuntamientos still exist in full force in the Mexican republic. By a decree of Charles V., Cortes was constituted governor of the new territory, which had been named New Spain, Oct. 15, 1522. The Indians, though converted, were distributed among the *conquistadores* and other Spanish officials and immigrants, and compelled as slaves to till the ground and labor in the mines. This system of *repartimientos* or distributions had already been applied and found fatal to the aboriginal inhabitants of the island of Hayti; but the Mexicans, a hardier people, did not so readily succumb. In 1528 was inaugurated the first *audiencia*, with Nuño de Guzman as president, and four auditors. The arbitrary and oppressive measures of this body caused considerable discontent in the colony; which, coming to the ears of the emperor, led to the suppression of the audiencias, and the estab-

lishment of a viceregal government in New Spain. The first viceroy, Don Antonio de Mendoza, ruled the country from 1535 to 1550. During his administration discoveries were actively prosecuted in the north; the first money was coined in Mexico; the printing press, the first in the new world, was introduced; the university of Mexico and several colleges were founded; and numerous important reforms were effected. Of the 64 viceroys who successively governed the country till 1821, but one was of American birth, Don Juan de Acuña, a native of Lima (1722-'34); and the most celebrated after Mendoza was Don Juan Vicente Guemes Pacheco, second count of Revillagigedo (1789-'94). In his time were accomplished many important improvements: the streets of the principal cities were drained, paved, and lighted, and provided with a tolerably efficient police; persons of known probity were placed in the public offices; and municipal revenues were introduced.—At the beginning of the present century, society in New Spain consisted of four classes, of opposite tendencies and interests: the pure-blooded Indians, the creoles or pure-blooded descendants of the early Spanish settlers, the mestizos or half-breeds, from the union of whites and Indians, and the Spaniards of European birth. The condition of the Indians had but little changed under the viceroys; they were compelled to pay tribute, and were held in a sort of tutelage which only ended in the tomb. The Indian nobles or caciques were exempted from the degrading restrictions which weighed upon the others. As for the creoles, whose numbers were continually increasing, a policy due to ignorance of their real position in the community excluded them from all places of trust in the government, and even from the higher grades in the regular army. Upon such as had amassed great wealth titles of nobility were conferred, while conciliatory crosses were distributed to those of smaller fortunes; but the home government considered it imprudent to allow them to take part in the public administration, and placed it exclusively in the hands of the Spaniards. This, with other grievances, caused profound discontent among the creoles, who would probably have resented it by open rebellion, had they not been restrained by the apprehension that the Indians, aided by the mestizos, might avail themselves of that event for the destruction of all the whites. An ineradicable antipathy had already sprung up between the creoles and the Spaniards, whom they distinguished by the sobriquet of *gachupines*; yet probably no outbreak would have immediately ensued but for the events of 1808 in the Peninsula. The usurpation of Ferdinand's throne by a Bonaparte was unanimously protested against by both Spaniards and creoles in Mexico; but the public mind was agitated by intemperate discussions concerning the provisional government which the state of things made it necessary to organize; and the excitement was

not a little enhanced by the imprisonment of the viceroy, Don José de Iturrigaray, suspected of a design to seize the crown of Mexico (Sept. 16, 1808). After his arrest the prestige of Spanish authority sensibly declined among the Mexicans, who began to long for independence. A conspiracy was formed, and on Sept. 15, 1810, a revolt broke out in the province of Guanajuato, headed by a priest, Don Miguel Hidalgo, a man of much talent and considerable influence among the Indians. The insurrection soon assumed formidable proportions, Hidalgo having at one time 100,000 men under arms. He finally suffered several defeats, was betrayed to his enemies (March 21, 1811), and four months later shot in company with his companions in arms Allende, Aldama, and Jimenez. The contest was continued by Morelos, also a priest, who called a national congress, which met at Chilpanzingo in September, 1813, and in November declared Mexico independent. On Oct. 22, 1814, it promulgated at Apatzingan the first Mexican constitution, which is known by the name of that place. After several defeats Morelos was captured, carried to the city of Mexico, and executed as a rebel, Dec. 22, 1815. For several years the contest was a mere partisan warfare on the part of the patriots, of whom the principal chiefs were Victoria, Guerrero, Bravo, Rayon, and Teran. These were gradually driven from the field, and were killed, imprisoned, or obliged to hide in the mountains, so that long before 1820 the authority of Spain appeared to be fully reestablished in Mexico. But in the course of that year the news of the revolution in Spain, and of the proclamation of the constitution which Ferdinand VII. had been compelled to adopt, renewed the agitation among the Mexicans in favor of a liberal government. Don Agustín Iturbide, a native Mexican and a colonel in the Mexican army, who during the recent civil war had distinguished himself on the royalist side, now threw off his allegiance and began the second revolution by proclaiming Mexico independent, Feb. 24, 1821. The revolt of Iturbide was eminently successful. In the course of a few months the whole country recognized his authority, except the capital, and by a treaty signed at Cordova, Aug. 24, 1821, with the viceroy, Don Juan O'Donohu, he obtained possession of Mexico on Sept. 27, and instituted a regency, of which he was the head and O'Donohu one of the members. Eight months later, with the support of the army and the mob of the city of Mexico, Iturbide was proclaimed emperor on the night of May 19, 1822, under the title of Agustín I. His reign was short. On Dec. 2 Santa Anna, seconded by Bravo, Guerrero, and other chiefs, proclaimed the republic at Vera Cruz; and Iturbide abdicated on March 19, 1823, rather than see the country again plunged into civil war. The congress, which had been dissolved by Iturbide, but reconvened by him shortly before his abdication, appointed a new gov-

ernment, called *poder ejecutivo* (executive power), composed of Gens. Bravo, Victoria, Negrete, and Guerrero. Iturbide was condemned to exile, and embarked at Vera Cruz for London in May of the same year, just twelve months after his exaltation to the throne. On Oct. 4, 1824, the congress promulgated a constitution closely resembling that of the United States, and by virtue of which Mexico was formed into a republic with 19 states and 5 territories. Gen. Don Felix Fernando Victoria, better known as Guadalupe Victoria, one of the most intrepid heroes of the war of independence, was the first president, and Gen. Bravo the first vice president. Iturbide, who had the temerity to venture back to Mexico in this year, was arrested and shot at Padilla on July 19. In 1828 the candidates for the presidency were Gens. Gomez Pedraza and Guerrero; on the election of the former the opposite party took up arms, and a bloody contest ensued, which terminated in the downfall of Pedraza's government, and his flight from the country, Jan. 4, 1829. Guerrero assumed the executive functions on April 1. The year 1829 was marked by the recognition of the Mexican republic by the United States, and by an attempt made by Spain to regain possession of her lost colony. In July Brig. Gen. Barradas with 4,000 Spanish troops disembarked at Cabo Rojo near Tampico, but he was compelled to capitulate on Sept. 11, his troops being disarmed and sent to Havana. The vice president, Gen. Anastasio Bustamante, who was commanding a reserve corps at Jalapa for the purpose of repelling the invaders, pronounced against Guerrero, and, having succeeded in deposing him, was himself elected president in his stead, Jan. 11, 1830. Revolutionary disturbances continued till Feb. 14, 1831, when Guerrero, one of the principal leaders, was treacherously delivered up to his enemies and executed. His name is perpetuated in that of one of the present states of the republic. Bustamante was succeeded by Pedraza, who in turn was deposed by Santa Anna, the latter entering upon office on April 1, 1833, little more than three months after the inauguration of Pedraza. Bustamante was compelled to go into exile, and with him several other personages of political notoriety. Congress now passed laws suppressing the convents, and abolishing the compulsory payment of tithes. It also proposed to appropriate the property of the church to the payment of the national debt, but this measure led to insurrections and to further complications, which ended in 1835 in the abrogation of the constitution of 1824 and the conversion of the confederation of states into a consolidated republic, of which Santa Anna was nominally constitutional president, and practically dictator. This revolution was acquiesced in by all parts of the country except Texas, where several thousand American colonists had settled. The refusal of the Texans to submit to the cen-

tralized government, which they pronounced a usurpation, induced Santa Anna to march against them in the beginning of 1836 with an army, which was defeated and annihilated at San Jacinto, April 21, the Mexican president himself being taken prisoner. In the previous month a convention of delegates assembled at the town of Washington had declared Texas an independent republic. The captivity of Santa Anna threw Mexico again into confusion. Bustamante, who had returned from exile, became president April 19, 1837; but in the latter part of his term the power was virtually in the hands of Santa Anna, who, after a visit to President Jackson at Washington, had been sent back to Mexico in a United States ship of war in 1837. He held office as revolutionary provisional president from March to July, 1839, when Nicolas Bravo became president for a week. A long period of confusion followed, during which the constitution was suspended, and the government became a dictatorship, at the head of which were alternately Santa Anna, Bravo, and Canalizo (the two last as substitutes during the frequent absences of the first), from Oct. 10, 1841, to June 4, 1844. Constitutional government was resumed in 1844, with Santa Anna as president, under a constitution promulgated June 12, 1843. He was deposed and banished by a revolution, and was succeeded, Sept. 20, 1844, by Canalizo, who was deposed by a revolution in December. His successor, Herrera, was also driven from office by a revolution, Dec. 30, 1845. During his administration war commenced with the United States, in consequence of the annexation of Texas to the American Union. Herrera was succeeded by Gen. Paredes. In May, 1846, Gen. Taylor crossed the Rio Grande, and after a series of engagements in which the American arms were uniformly successful, Santa Anna, who had returned from exile, regained the presidency, and taken personal command of the army, was completely overthrown. By the treaty of Guadalupe Hidalgo, signed in February, 1848, the war was ended, and California and New Mexico were ceded to the United States. Santa Anna again left the country, but after the new administration of Herrera, and that of Arista, he was recalled in 1853, and was for the fifth time elevated to the presidency, though for a short season only; for having attempted to secure the office for life with the right to appoint at his death his own successor, he was deposed in August, 1855, by a revolution under Alvarez, governor of Guerrero, who was at once appointed to take his place. The latter resigned in favor of Comonfort in December of the same year, and a series of revolutions ensued, chiefly instigated by the so-called church party, whom the president made his implacable enemies by a law recommended by him and adopted in June, 1856, for the sale of the church lands and the freedom of religious belief. In March, 1857, a new and very democratic constitution

was promulgated by congress, and Comonfort was constrained to accept it; but, owing to strenuous opposition from the church party, it did not come into operation till May. Meantime the repudiation of an acknowledged debt to Spain seemed likely to involve the republic in a war with that power; the president sought in vain for aid from the United States, and conspiracies multiplied on every side. Comonfort, although confirmed in the presidency under the new constitution in September, announced in December a change of government and of constitution; and in January, 1858, he was superseded by Zuloaga, who for a while had been his supporter, and was forced to take refuge in the United States. Zuloaga was immediately opposed by Benito Juarez, who, as chief justice of the supreme court, was by the provisions of the constitution the late president's lawful successor. Juarez was defeated; but he went to Vera Cruz, and there established himself as constitutional president on May 4. Zuloaga was constrained to abdicate in favor of Miguel Miramon, his own general-in-chief, Jan. 1, 1859. Miramon, a successful soldier rather than a good statesman, relied solely upon the fortune of arms for the subjection of Vera Cruz. Leaving Zuloaga as provisional president, he set out upon a series of campaigns, which terminated in that of Calpulalpam and the triumphal entry of Juarez into the capital on Jan. 11, 1861. Much of Juarez's success was due to the recognition of him as the head of the government by the United States. While still at Vera Cruz he began the series of reforms which rendered his administration so popular on the one hand, but on the other paved the way for foreign invasion. Among them stand most prominent the making marriage a civil contract, the abolition of perpetual monastic vows and of ecclesiastical tribunals, the suppression of monasteries, and the appropriation of church property to the service of the state, the total value of which was estimated at rather more than \$300,000,000, or nearly one half the value of all the landed property in the country. These measures were soon followed by the complete separation of church and state. But the church party had resolved upon the destruction of Juarez's government, although national liberty should be sacrificed for its accomplishment. A favorable opportunity soon offered. Spain, France, and England urged claims for the reparation of injuries and losses alleged to have been sustained by their subjects resident in Mexico; and no satisfaction having been obtained from Juarez, he was informed that a joint expedition from the three powers would be sent to demand it, a measure agreed upon by the convention of London, Oct. 31, 1861. In December Vera Cruz was occupied by Spanish troops from Cuba, commanded by Gen. Prim, and in January, 1862, by French and British forces. But it was soon discovered that the English and Spanish claims could be settled by negotiation;

it was agreed that a portion of the customs receipts should be appropriated to their liquidation; and in May the forces of both these powers were withdrawn from the country. The French army remained in the republic, thereby tacitly avowing their intention to overthrow the existing form of government in Mexico. This determination appears to have been solely prompted by Almonte and other agents of the church party sent to Europe for that purpose, and it was readily concurred in by Napoleon III. The French refused to treat with Juarez, and war was declared on April 16, 1862. Almonte, appointed president by the Vera Cruz authorities, who had revolted against Juarez (June 3), was deposed and his government dissolved on Oct. 2 by a decree of Gen. Forey, the French commander. Hostilities began with an attack on Puebla by the French, who were then defeated, but who, after a number of subsequent engagements of varying success, occupied Mexico city on June 10, 1863, Juarez and his ministry having removed to San Luis Potosí. A regency was formed on the 24th; on July 8 an assembly of notables was convened, with power to decide upon the form of the future government of Mexico; and on the 10th it resolved, by 250 votes against 20, upon a hereditary monarchical government under a Roman Catholic emperor. The crown was accepted by the archduke Maximilian of Austria, with the title of Maximilian I., emperor of Mexico. He arrived at the capital on June 12, 1864. The republican president, continually pursued by the imperialists, arrived by successive retreats at El Paso in September, 1865, and remained there until the commencement of the following year. On March 25, 1866, the Juarist troops captured Chihuahua, and that victory was followed by a number of others. After repeated remonstrances from the United States government, the French troops, under Bazaine, were withdrawn from Mexico early in 1867, the last detachment embarking at Vera Cruz on March 16. Maximilian, now left to his own resources, deemed it expedient to leave the capital and proceed northward. Toward the end of February he set out at the head of about 5,000 men, and reached Querétaro, which was at once besieged by Gen. Escobedo with an army of 20,000 Juarists; Mexico, Puebla, and Vera Cruz being simultaneously invested by other divisions of the republican forces. The ill-fated emperor was captured (May 15), tried by court martial, condemned, and shot, together with his two generals, Miramon and Mejia, on June 19. Juarez reentered the capital on July 16, and was reelected president in the following October. During his flight before the imperial forces in the north his term of office had expired; but he issued a decree prolonging his exercise of the presidential functions until it should become possible to summon the representatives for a new election. The work of reconstruction was interrupted for a short time by an

attempt on the part of Santa Anna to occupy some of the gulf ports and promote a conspiracy against Juarez, who had rejected his offer to assist him in driving out the invaders. He was captured at Sisal on July 12, 1867, tried at the castle of San Juan de Ulua, and condemned to banishment for eight years. The years 1868 and 1869 were marked by insurrections, *pronunciamientos*, and revolutions, the most formidable of which was the *pronunciamiento* of Angel Santa Anna, who was taken, after four months of depredations and bloodshed, and shot, in company with his followers. President Juarez was again elected in 1871, the opposing candidates having been Gen. Porfirio Diaz and Don Sebastian Lerdo de Tejada. Juarez is remarkable as having been the first president of Mexico who held power during his full term of office. He died on July 18, 1872, and was succeeded by Lerdo de Tejada. The republic is at present (1875) in a state of comparative peace; the laws are more faithfully observed, or at least less disregarded; the military seem to be reconciled to the idea of enduring a civilian at the head of the government; public education is in a prosperous condition; internal improvements are in progress; brigandage is gradually disappearing; and mining is likely to be extended before long by the adoption of suitable machinery.—See Solis, *Historia de la conquista de México* (Madrid, 1684; new ed., Paris, 1858; translated into English, 2 vols., London, 1724); *Boletín de la sociedad de geografía de México* (1854 et seq.); Pimentel, *Cuadro descriptivo y comparativo de las lenguas indígenas de México* (2 vols., Mexico, 1862); Orozco y Berra, *Geografía de las lenguas de México* (Mexico, 1864); Payno, *Historia de México* (Mexico, 1871); Clavigero, *Storia antica del Messico* (4 vols. 4to, Cesena, 1780-'83; translated into English, 2 vols. 4to, London, 1787; Spanish, London, 1824); Humboldt, *Essais politiques sur la Nouvelle Espagne* (revised ed., 4 vols. 8vo, Paris, 1827); Lord Kingsborough, "Mexican Antiquities" (9 vols. fol., London, 1831-'48); Prescott, "History of the Conquest of Mexico" (1843; revised ed., 3 vols., Philadelphia, 1874); Brantz Mayer, "History of the War between Mexico and the United States" (New York, 1848), and "Mexico, Aztec, Spanish, and Republican" (1852); Mansfield, "The Mexican War" (New York, 1848); Kendall, "The War between the United States and Mexico" (New York, 1851); Helps, "The Life of Hernando Cortes, and the Conquest of Mexico" (London, 1871).

MEXICO, a state of the republic of the same name, bounded N. by Hidalgo, E. by Tlaxcala and Puebla, S. E. by Morelos, S. by Guerrero, and W. by Michoacan; area, 9,598 sq. m.; pop. in 1869, 650,663. Two great mountain chains traverse the state, and, with their branches, divide it into three picturesque and fertile valleys, the principal of which is that of Mexico, and the other two are Tlaxcala and Toluca. The highest summits are those of the south and

southeast, among which are Popocatepetl and Iztaccihuatl. The chief and only important river is the Lerma, which, rising in the lake of its own name, flows N. W. into Michoacan and falls into Lake Chapala. The most remarkable feature in the hydrography of the state is its lakes: Chalco, Xochimilco, Tezcuco, Xaltócan, San Cristóbal, and Zumpango in the valley of Mexico, and Lerma in that of Toluca. The average elevation of the state is 7,500 ft. above the sea. Its climate is equal to the mildest, most equable, and most salubrious of the temperate zone; the mean annual temperature is 65° F., the thermometer never descending below 57°, while the maximum summer heat is 70°. There are really but two seasons, the rainy from June to October, and the dry during the remaining months. The metals found here are gold, silver, lead, iron, and antimony; cinnabar and sulphur abound; some coal occurs; and lithographic stone and marbles of several varieties are plentiful. The soil is remarkably fertile, and the state, one of the most agricultural in the republic, produces maize, wheat, rye, barley, several kinds of beans, the sugar cane, plantain, and especially the maguay. Tropical fruits abound here, and all the fruits and vegetables of the temperate zones. The forest-clothed hills and mountains afford an abundance of timber of several varieties. The chief industries are mining, agriculture, the manufacture of woollens and cottons (the cassimeres and

other fabrics of Temoscaltepec and Tenancingo being of superior quality), and glass and earthenware, some of which is not inferior to that imported from Germany. Cattle rearing, once a vast source of wealth, has materially dwindled of late years, the annual value of the stock not exceeding \$3,000,000. The commerce is valued at \$12,000,000 yearly. This state is traversed by the Mexico and Vera Cruz railway, and those of Talpan and Toluca, and by several lines of telegraph. The state is divided into 16 districts, and the capital and chief town is Toluca. In 1874 there were 388 primary public schools, of which 336 were for males, and the total attendance was 22,120, about 3,000 of whom were females. Of the 51 private schools 34 were for males; the aggregate attendance was 2,529, and of these 1,027 were females. The only high school supported by the state government is the *instituto literario*, with 670 students, the annual outlay for which is \$36,000.

MEXICO, a city and the capital of the republic and of the federal district (area, 85 sq. m.) of Mexico, situated in the centre of the valley of Mexico, and in the great central table land of the country, at an elevation of 7,469 ft. above the sea, according to Humboldt, or 7,602 ft. by Talcott's measurement; lat. 19° 26' N., lon. 99° 7' W.; pop. according to an official return in 1869, 200,000; according to later authorities, about 250,000. Of the natives, the whites are the least numerous element, the mestizos and



Plaza de Armas, Mexico.

pure-blooded Indians forming by far the largest proportion; and there are besides many Germans, French, Italians, Spaniards, and other Europeans, with some Americans. The Germans are either manufacturers or brewers, or are engaged in the higher branches of com-

merce; the French and Spaniards are mostly retailers, the former dealing in articles of fancy and luxury; the English are for the most part bankers, or, like the Americans, are connected with mechanical and engineering enterprises. The various public vendors, muleteers, water

carriers, domestics, &c., are commonly Indians or mestizos. Beggars are extremely numerous, and the ragged vagrants are called *léperos* or lepers. Mexico ranks among the largest cities in the western hemisphere, and, with its steeples, towers, and domes, presents, from whatever direction approached, an aspect of grandeur and magnificence unsurpassed by any in the world. It is divided into 8 *cuarteles mayores* or large wards and 32 smaller, comprising 245 blocks or squares of houses, 330 streets, and 130 *callejones* or lanes. The streets are wide and straight, crossing each other at right angles, well paved, lighted with gas, and furnished with spacious sidewalks, a feature rarely met with in Spanish-American towns. The houses, especially in the central and W. portions, are mostly of three stories, strongly built of stone, often painted in brilliant colors, and having a balcony before every window. Mexico is lavishly supplied with public squares, the finest of which is the plaza de Armas, in the middle of the town; the centre is laid out in a garden with flower beds, shady trees, and benches, and a band is in attendance almost every evening. The plaza is 810 ft. long by 600 ft. wide. On the N. side, occupying the site of the ancient Aztec pyramid and teocalli, stands the cathedral, a majestic edifice, though the architecture is an irregular mixture of the Gothic and Italian styles. The front is decorated with carving, and there are two lofty towers ornamented with statues. The interior is rich and gorgeous, and the numerous crucifixes, candlesticks, reliquaries, &c., of gold and silver adorned with jewels, are said to be of immense value. In the vaulted roofing is a much admired painting by Juneiro. The cathedral is 500 ft. long by 420 broad. It was founded in 1573 under the auspices of Charles V. and Pope Clement VII., and completed in 1667. The E. side of the plaza is occupied by the government house, containing the president's apartments, the various government offices, the chamber of representatives, and the ambassadors' hall with full-length portraits of several Mexican patriots, headed by a magnificent one of Washington. To the government house are attached several courtyards and a botanic garden; this edifice, erected in 1693, stands upon the spot occupied by the palace originally constructed by Cortes for himself, and which, until its destruction by fire at the hands of the populace in 1692, had successively

served as the residence of 30 viceroys. Facing the cathedral is the *cabildo* or city hall, in which is contained the merchants' exchange; and on the same side is the *portal de los flores*, an extensive arcade, similar to the *portal de mercadores*, which flanks the W. side of the



The Cathedral.

plaza, and before the numerous and showy shops in which are spread to view on stalls endless varieties of filigree work in gold and silver, and other ornamental articles. On the plaza de Santo Domingo are three noteworthy edifices: the convent of the same name, remarkable for its handsome chapel, the old inquisition building, now the school of medicine, and the custom house. Other celebrated churches of Mexico are those of San Fernando, Loreto, Encarnacion, Jesus Maria, the chapel of Santa Teresa with a superb cypress in marble, and that of the Concepcion, all celebrated for the beauty of their architecture or their gorgeous and costly decorations. Mexico includes 14 parishes. Eight convents and 21 nunneries which were suppressed by President Juarez's reform law of July 12, 1859, have since been converted into school houses. In the mint were coined, from 1690 to 1853, \$1,702,650,087; and the gold and silver coinage in 1867 amounted to \$4,304,313 95. The national museum, on the N. side of the government palace, contains one of the finest and most extensive collections of paintings in America; and in the school of fine arts are preserved rare specimens of sculpture, painting, engraving, and design. In the courtyard of the national museum are exposed a circular monolith calendar attesting the high degree of civilization attained by the Toltecs, whose year almost exactly coincided with the Julian year; a ponderous statue of Huitzilopochtli, the Aztec god of war, bearing no semblance of human form or feature, but being a fantastic and heterogeneous group-

ing of death's heads, hands interlaced, snakes, feathers, &c.; a sacrificial stone; and a number of idols and other minor relics from various parts of the country. Two other handsome piles are the post office and the hotel Iturbide, the latter having been for a short season the residence of Agustín I. The principal promenade is the Alameda, shaded with stately beeches, embellished with nine fountains and eleven *glorietas* or summer houses, and tastefully laid out in spacious walks. This is a favorite resort on Sunday mornings, when a regimental band plays for two hours. Other *paseos* are those of the Viga, extending along the canal of that name, on which has been erected a colossal bust of Guatemozin, the last emperor of the Aztecs; and the paseo de Bucareli, with a superb bronze equestrian statue of Charles IV., modelled by Manuel Tolsa.—In 1874 Mexico had 218 public schools, 77 of which were for females and 48 for both sexes; the average attendance was 16,915. These schools include the *escuela preparatoria*, formerly the college of San Ildefonso (under the rectorship of Señor Lerdo de Tejada till 1872), the schools of jurisprudence, medicine, agriculture, engineering, fine arts, commerce, arts and trades, deaf and dumb, and those sustained by the municipal government and the Lancasterian company, one or two by private individuals, and a number by benevolent societies. The school of engineering has a fine collection of specimens in natural history, and a cabinet of mineralogy. The philharmonic society, with a subsidy from the government, supports a musical conservatory for both sexes. There are also a seminary for the education of priests, a school for the blind, and a night school for adults. The public has access to two libraries: the *gran biblioteca nacional*, with upward of 100,000 volumes and manuscripts, and the *biblioteca popular del cinco de Mayo*. There are 21 societies, scientific, artistic, or commercial, including the geographical and statistical society, and the Humboldt society of natural history. The theatres are much more numerous than beautiful or commodious, and with a circus are the only public places of amusement in Mexico, the bull ring having been demolished in 1874. The city supports five hospitals, an insane asylum for males and one for females, and a house of correction. Two institutions of comparatively recent foundation take care of young children during the day, in order to leave their mothers at liberty to work. The principal cemeteries hitherto in use are now closed, being within the municipal limits; their place has been supplied by the general cemeteries of La Piedad and Campo Florida, the French, and the Protestant cemeteries. There are four very good markets, constantly stocked with an abundance of the productions of all the zones. All the fruits and vegetables generally regarded elsewhere as delicacies here come to market every day in the year, and the supply of tropical fruits is inex-

haustible. Most of the vegetables and fruits are grown upon the *chinampas* or so-called floating islands on Lake Tezcuco, and brought to market in boats by the canal de la Viga; and prodigious quantities of flowers of most brilliant colors and most fragrant odors are daily brought to the city in the same way. A new abattoir was erected in 1874, at a cost of \$500,000. The water supply reaches the town by two aqueducts of monumental proportions, one bringing *agua gorda* (thick water) from Chapultepec, and the other *agua delgada* (light water) from the southwest.—The climate is mild, equable, and very salubrious; the mean annual temperature is 70°. The more common diseases are pneumonia, dysentery, and diarrhœa, and the average mortality is about 3 per cent. of the population.—The chief occupations of the inhabitants are agriculture, the manufacture of paper, earthenware, cotton, woollen, and silk fabrics, the preparation of tobacco, and the importation of the various products of the adjoining states and of manufactured goods, wines, &c., from Europe, the United States, and the West Indies, especially the island of Cuba. The chief financial institutions are the bank of London, Mexico, and South America, and numerous private banking houses; a government pawn office, with branches in several parts of the city; and 18 lotteries, with an aggregate risk capital of nearly \$2,500,000, and paying a mean annual license of \$150,000 to the central government. The chief places of interest in the vicinity are Guadalupe Hidalgo, Tlalpan, San Angel, Mixcoac, Coyocacan, Atzacapozalco, Churubusco, Tacuba, Tacubaya, noted for its handsome private houses, and Papotla and Chapultepec. Almost all these places are reached by railway (with steam or horse power) or omnibus from Mexico, which is likewise connected by railway with Puebla, Orizaba, Cordova, and Vera Cruz; and a line is in process of construction to Toluca.—Mexico owes its chief historical interest to its situation upon the site of the ancient city, the capital of the Montezumas. The Aztecs or ancient Mexicans, after their migration from the north, wandered for a long time in the Mexican valley, till in 1325 they halted on the S. W. borders of the lake of Tezcuco, and there beheld an eagle perched on the stem of a nopal, and devouring a serpent. An oracle having announced the omen as auspicious, and as indicating the site of their future metropolis, they founded it upon the islets of Lake Tezcuco, calling the place Tenochtitlan, "nopal on a stone," in allusion to the omen. Its name of Mexico was subsequently derived from that of their god Mexitli. By the middle of the 15th century the city had become large and prosperous, and in place of reeds and rushes were substituted stone and lime; and when on the evening of Nov. 7, 1519, its long lines of glittering edifices first met the eyes of Cortes and his followers, it looked, says Prescott, like a thing of fairy creation rather than the

work of mortal hands. On their entry into Mexico next day the Spaniards found fresh cause for admiration in the grandeur of the city and the superior style of its architecture. The city was 9 m. in circumference, and the number of its houses was about 60,000, and of inhabitants probably 600,000. Though a few of the streets were wide and of great length, most of them were narrow and lined with mean houses. The large streets were intersected by numerous canals crossed by bridges. The palace of Montezuma, near the centre of the city, was a pile of low irregular stone buildings of vast extent. Another palace, assigned to Cortes on his entrance into the city, was so large as to accommodate his whole army. But the most remarkable edifice of the city was the great *teocalli* or temple, completed in 1486. It was encompassed by a stone wall about 8 ft. high, ornamented on the outer side by figures of serpents in basso-rilievo, and pierced on its four sides by gateways opening on the four principal streets. Over each gate was an arsenal, and barracks near the temple were garrisoned by 10,000 soldiers. The temple itself was a solid pyramidal structure of earth and pebbles, coated externally with hewn stones. It was square, its sides facing the cardinal points, and was divided into five stories, each of which receded so as to be smaller than that below it. The ascent was by a flight of 114 steps on the outside, so contrived that to reach the top it was necessary to pass four times round the whole edifice; and the base of the temple is supposed to have been 300 ft. square. The summit was a large area paved with broad flat stones. On it were two towers or sanctuaries, and before each was an altar on which a fire was kept continually burning. The top of this remarkable structure commanded a superb view of the city, lake, valley, and surrounding mountains. The police of the city was efficient and vigilant; and 1,000 men were daily employed in watering and sweeping the streets. As the lake that surrounded the city was extremely brackish, pure water for the supply of the people was brought by an aqueduct from the neighboring hill of Chapultepec, where Montezuma had a summer palace surrounded by vast and magnificent gardens. In the final siege by the Spaniards, Cortes, despairing of otherwise subduing a place where every house was a fortress and every street was cut up by canals, reluctantly determined to destroy the city, which he calls "the most beautiful thing in the world." With the aid of his multitudinous Indian allies, whose hatred of the Aztecs led them to work with zeal, in a few weeks seven eighths of the city was levelled to the ground, and the canals filled with the rubbish. Soon after the termination of the siege Cortes began to rebuild the city on its present plan, assembling for the work a host of Indians, estimated by a Mexican writer at 400,000. During its occupation by the Spaniards, from 1521 to 1821, the most

remarkable events in the local history of Mexico were five great inundations in 1553, 1580, 1604, 1607, and 1629, caused by the overflowing of the neighboring lakes. To prevent the recurrence of these inundations a great drain was dug through the hill of Nochistango, by which the waters of the river Cuautitlan were led out of the valley instead of falling into the lake of Tezcuco. This work, which was completed in 1789, after more than 100 years of labor, is about 12 m. long, from 100 to 130 ft. deep, and between 200 and 300 ft. wide. Since the establishment of Mexican independence, the city has been the scene of several revolutions and insurrections, and a number of important battles have been fought in the vicinity, the most noted being those of Contreras and Churubusco, Aug. 20, 1847, and of Chapultepec, Sept. 13, fought between the American army under Gen. Scott, and the Mexican army under Gen. Santa Anna. After this battle the Americans occupied the city, and held it until the ratification of the treaty of Guadalupe Hidalgo, in May, 1848.

MEXICO, Gulf of, a basin of the Atlantic ocean, enclosed by the United States, the West Indies, and Mexico, and measuring about 1,000 m. from E. to W. and 800 m. from N. to S.; area, about 700,000 sq. m. The states of Florida, Alabama, Mississippi, Louisiana, and Texas border upon it on the north, and the Mexican states of Tamaulipas, Vera Cruz, Tabasco, Campeachy, and Yucatan on the west and south. Its entrance, between Cape Sable at the extremity of the peninsula of Florida and Cape Catoche at the extremity of the peninsula of Yucatan, is about 450 m. in width; but midway across this mouth lies the island of Cuba, leaving a passage on either hand, viz.: the strait of Florida on the northeast, 125 m. wide, communicating with the Atlantic, and the channel of Yucatan on the southwest, communicating with the Caribbean sea, 115 m. wide. West of Yucatan extends the broad bay of Campeachy; on the coast of Texas are the bays of Corpus Christi, Aransas, Matagorda, and Galveston; in Louisiana are those of Vermilion, Atchafalaya, Barataria, Black, and Lake Borgne; in Alabama, Mobile bay; in Mississippi, Mississippi sound; and in Florida, Pensacola harbor, Appalachicola, Appalachee, Tampa, and Charlotte bays, and the bay of Ponce de Leon. Besides these, the coasts, being mostly low and marshy or sandy, are lined with numerous lagoons. There are few islands except some small ones belonging to Yucatan, a number near the delta of the Mississippi, and the Florida keys. The most important rivers of the gulf are the Suwanee and Appalachicola in Florida; the Mobile in Alabama; the Pascagoula and Pearl in Mississippi; the Mississippi in Louisiana; the Sabine, Trinity, Brazos, Colorado, Nueces, and Rio Grande in Texas; and the Pánuco, Coatzacoalcas, Tabasco, and Usumasinta in Mexico. These streams are nearly all obstructed by bars at their

months, and there are very few good harbors. Havana, Mobile, and Galveston are the most important ports; and Campeachy and Vera Cruz are two of the principal shipping points.—The depth of the gulf is believed not to exceed three quarters of a mile. The reefs and shoals of the N. shore of Cuba and about the Florida keys render the passage into the Atlantic exceedingly intricate, but elsewhere there are few banks; the only large one lies about lat. 27° N., lon. 86° W., 200 m. S. of Cape San Blas. Besides the N. E. and S. E. trade winds which prevail in the gulf, it is visited by violent northers, which occur at intervals from October to May; in some years they terminate in April. The most remarkable phenomenon connected with the gulf of Mexico is the Gulf stream (see ATLANTIC OCEAN), which enters it by the channel of Yucatan, passes around it, and flows out by the Florida channel. The temperature of the gulf water is 8° or 9° higher than that of the Atlantic ocean in the same latitude. In its centre are found large quantities of *fucus natans* or gulf weed, floating in parallel lines from S. E. to N. N. W.

MEYENDORFF, a Russian family, originating in Saxony, and including among its members Pope Clement II. They settled in Livonia about 1200, and became Swedish barons in the 17th century. Subsequently they acquired distinction in the Russian military and diplomatic service, especially PETER (1796–1863), who was ambassador in Vienna in 1850, and one of the negotiators of the convention of Olmütz; ALEXANDER (died in 1865), a geographer and geologist, who promoted and accompanied in 1840 Murchison's and Verneuil's exploration of northern Russia; GEORG (died in 1863), who published *Voyage d'Orenbourg à Boukhara* (Paris, 1826); and FELIX (died in Carlsruhe, Jan. 16, 1871), who in 1857 married the princess Olga, a daughter of the late prince Michael Gortschakoff, became secretary of legation in Berlin, and in 1864 chargé d'affaires in Rome, his stormy interview with the pope, Jan. 1, 1866, resulting in a temporary rupture between the cabinet of St. Petersburg and the holy see. Subsequently he was chargé d'affaires at Carlsruhe.

MEYER, Felix, a Swiss painter, born in Winterthur, canton of Zürich, Feb. 6, 1653, died May 28, 1713. He studied painting under Ermels in Nuremberg, and gained reputation by his views of Swiss scenery. He was employed throughout Germany by princes and others in ornamenting their apartments in fresco. He also etched several plates of landscapes from his own designs.

MEYER, Johann Georg, known as MEYER VON BREMEN, a German painter, born in Bremen, Oct. 28, 1813. He studied at Düsseldorf, and settled in Berlin in 1852. He acquired celebrity as a painter of childhood, and his works are popular in England, France, and the United States. Many of them have been engraved.

MEYER, Johann Heinrich, a German writer on art, born at Stäfa, on the lake of Zürich, March 16, 1759, died in Weimar, Oct. 14, 1832. He was a pupil of J. C. Füssli, brother of J. H. Fuseli, and in 1786 visited Rome, where he formed so close an intimacy with Goethe that he was known as Goethe-Meyer. In 1797 he established himself in Weimar, and in 1807 was appointed director of the academy of painting. As a painter his productions were few and unimportant. He was the principal editor of Winckelmann's works (8 vols., Dresden, 1808–'20), and furnished most of the elaborate notes, which he afterward arranged as a history of Greek art, under the title of *Geschichte der bildenden Künste bei den Griechen* (2 vols. 8vo, Dresden, 1824; vol. iii., 1836).

MEYER, Leo, a German philologist, born at Bledeln, Hanover, July 3, 1830. He completed his studies in Göttingen, and under Bopp and the brothers Grimm in Berlin, and was professor in the university of Göttingen from 1856 to 1865, when he was appointed to the chair of comparative philology at Dorpat. He has published numerous works on Greek philology and mythology, including *Vergleichende Grammatik der griechischen und lateinischen Sprache* (2 vols., Berlin, 1861–'5), and *Gedrängte Vergleichung der griechischen und lateinischen Declination* (1862). His most celebrated production is *Die gothische Sprache: ihre Lautgestaltung insbesondere im Verhältniss zum Altdindischen, Griechischen und Lateinischen* (1869).

MEYERBEER, Giacomo, a German composer, born in Berlin, Sept. 5, 1794, died in Paris, May 2, 1864. His original name was Jakob Meyer Beer. (See BEER.) His parents belonged to a wealthy Jewish family, distinguished for a love of music. Giacomo displayed from his earliest childhood remarkable musical capacities; and it is said that in his fifth year he used to play little tunes spontaneously on the piano. His first teacher on that instrument was Franz Lauska, an artist of local reputation. In the theories of music he was instructed by Karl Friedrich Zelter, afterward teacher of Mendelssohn. His performance on the piano soon elicited general admiration, but he preferred to devote himself to the study of dramatic composition. Bernhard Anselm Weber, his first instructor in that branch of the art, was succeeded in 1810 by the abbé Georg Joseph Vogler, one of the most eminent scientific musicians and the principal organist of Germany, who had opened in Darmstadt a school to which only young men of remarkable talent were admitted. While in this school he became acquainted with Karl Maria von Weber, who, after composing several operas, had resumed his studies at Darmstadt. Meyerbeer and Weber lived together for nearly two years in the same room, and their intimate relation lasted until the death of the latter (1826), who left the last two acts of his opera, "The three Pintos," to be completed by his friend. While

in Darmstadt Meyerbeer composed an oratorio, *Gott und die Natur*, which was received with great favor by the grand ducal family, and caused him to be appointed composer to the court. After about two years' study he set out on a tour through Germany, in company with Vogler, under whose auspices he produced his opera "Jephthah" at Munich in 1812. This, on account of its scientific precision, gave so much satisfaction to his teacher, that he pronounced him to have reached the climax of musical science, and handed him his official diploma as "maestro." But "Jephthah" had no elements of popularity, and was considered a failure. Discouraged by this reception, and at the same time impressed by the genius of Hummel, Meyerbeer now made his début as a pianist at Vienna, with brilliant success. The court of Vienna commissioned him to compose an opera, and he soon produced *Die beiden Khalifen*, which was no more successful than "Jephthah," both operas being totally opposite to the popular taste, which at that time was delighted with the productions of Rossini and Italian music generally. His friend Salieri prevailed upon him to visit Italy. Meyerbeer on his arrival there witnessed the performance of Rossini's "Tancred," and his enthusiasm for the Italian school now became as great as his aversion for it had formerly been. He began to imitate the Italian style, and composed in rapid succession a series of operas, which were almost all favorably received. His *Romilda e Costanza* was performed in Padua in 1818; his *Semiramide riconosciuta*, after Metastasio, in Turin in 1819; and his *Emma di Resburgo*, based upon the same subject as Méhul's "Helen," in Venice in 1820, in the same season with Rossini's *Eduardo e Cristina*, the productions of the German and Italian masters receiving the same share of enthusiastic applause. "Emma" was translated into German and performed in the principal opera houses of his native country. In the mean time it had been received with great enthusiasm by the fastidious audiences of the Scala in Milan, and paved the way for the favorable reception there of his next opera, "Margaret of Anjou" (1822), in which Levasseur made his début on the Italian stage. This was succeeded by *L'Esule di Granata* (1823), the principal parts of which were written for Lablache and Pisanoni. But the procrastination in its performance, which did not take place before the carnival of that year, proved fatal to its reception. The first act was hissed, and the second would have shared the same fate but for a duet admirably sung by Lablache and Pisanoni. Subsequently the opera proved successful. "Almanzor" was also composed in 1822, and intended for the opera of Rome; but owing to the illness of Carolina Bassi, who was to take the principal part, it was never brought out. The *Crociato* was given in Venice at the end of 1825, and at the close of the performance

Meyerbeer was called before the curtain and crowned amid the plaudits of the audience. He now made the tour of the different Italian cities, to attend personally to the production of his works. The *Crociato* may be taken as the best and most individual of his productions up to that time, the style of which had been marked by a successive improvement, and formed a turning point in Meyerbeer's career. M. de La Rochefoucauld invited him to Paris (1826), where the *Crociato* was received with considerable favor, and Paris was henceforth his headquarters. In 1826 he composed *Robert le diable*, which he sold in July, 1830, to M. Lubbert, director of the grand opera, and which made the fortune of his successor, M. Véron. After many rehearsals it was at length brought out in November, 1831. The excitement it created was unparalleled in the history of the Parisian stage. It combined in a singular degree oriental gorgeousness, German thoughtfulness, French vivacity, and Italian brilliancy, and exhibited a breadth and depth of talent for which the preceding works of the composer, with the exception of some parts of the *Crociato*, had hardly prepared the public. The enthusiasm which greeted it in Paris was shared by nearly all Europe, but it found perhaps more admirers in Germany and France than in other countries, and never fully received recognition in England. The Germans especially were fascinated by an opera which in some respects reminded them of Goethe's "Faust," and which combined in so remarkable a degree the convivial, picturesque, pathetic, and supernatural elements. The most popular airs were soon transferred from the stage to the streets, and sung in the taverns. Jenny Lind won her brightest laurels in London by her personification of Alice, and Formes invested Bertram with an intellectuality almost equalling that of Goethe's Mephistopheles. The melodies of "Robert," the best produced by Meyerbeer, are in the main formed upon the style of Rossini, with certain changes. It has Weber's supernaturalism and the developed orchestration of the period, with the extensions proper to a long subject fully handled. The keen and subtle intellectuality of the composer is revealed throughout the whole work in his effort to make it in every sense acceptable to Parisian audiences. Hence his adoption of the extended musico-dramatical form, so popular in France; his attention to effective contrasts and sequences, which the French dramatists and lyrical composers treat with such consummate skill; his introduction of a vast range and variety of scenic accessories; the sonority of the orchestra, so much insisted upon at the grand opera; and the selection of a libretto by Scribe, which rivets the attention of the audience through the whole of five long acts, without for a moment abating in interest. Meyerbeer reached the climax of his fame by his opera *Les Huguenots*. The admiration which this work elicited on its first appearance

in Paris in March, 1836, has not yet diminished; and even in Berlin, where his productions had been subjected to the adverse criticism of jealous rivals and of antagonistic schools of music, all depreciating voices were hushed by the "Huguenots," and the friends and foes of the composer became for the first time unanimous in their admiration of his genius. The dramatic character of the "Huguenots" is not surpassed by any work of the lyrical stage, and the strife between the great religious parties in France was never before portrayed with such graphic power and thrilling effect. The "Huguenots" is, above all, to be regarded as one of the first of the operatic achievements which derive their inspiration from the records of history; and it contributed to inaugurate the era of the lyrico-historic drama, in which the greatest effects that the musical and dramatic stage and its accessories are capable of are used to illustrate the most momentous conflicts of mankind. Like most great works, those of Meyerbeer required time in their elaboration, and 13 years elapsed before his next opera, *Le prophète*, was ripe for performance. It appeared in 1849, and at once took a high place as a worthy successor of the "Huguenots." Although much less imposing in its historic groundwork and in its general effect, it shows the same largeness of musical and artistic treatment; and as a lyrical drama it derives great beauty from the admirable manner in which the maternal love of Fides is placed in contrast with the religious frenzy of her son, the prophet of Leyden. The scores in this opera, as in Meyerbeer's other works, are wonderful in their elaboration, and may be commended to students for their careful dramatic portraiture, in which the orchestra is made to echo or anticipate the characterization of the scene. The extraordinary labor bestowed upon the *mise en scène* of the "Prophet" has been deemed superfluous by several critics, who regard this excessive elaboration of external effects as derogatory to the genius of the composer and to the intrinsic merits of his works. The "Prophet" was followed by *Pierre le Grand* (*L'Etoile du nord*, 1854), and "Dinorah" (*Le pardon de Ploermel*, 1858). The former of these shows the versatility of the author, though its success cannot be compared with that of its great predecessors. "Dinorah," which treats a rustic and pastoral theme, is variously criticised in Europe, and unfavorably as regards melody. Meyerbeer published a great number of miscellaneous musical compositions, among which are *Le camp de Silésie*, an opera produced at Berlin; a *Stabat*, a *Miserere*, a *Te Deum*, eight of Klopstock's canticles, a number of cantatas, many songs for solo voice with pianoforte accompaniment, and some minor orchestral works. He wrote also the incidental music for his brother's drama of *Struensee*. He was for many years engaged upon the opera *L'Africaine*. This work was elaborated with the same indomitable care that

the composer had bestowed on *Robert le diable* and *Le prophète*, and exhibits the same characteristics of its author, a profound knowledge of all the elements of effect and labored detail rather than inspiration. Although it was completed several years before his death, he delayed its production, waiting to find a prima donna who should satisfy his ideal of Selika. It was brought out in Paris in April, 1865, and in New York in December of that year.—See *Meyerbeer et son temps*, by H. Blaze de Bury (Paris, 1865), and *Giacomo Meyerbeer, sein Leben und seine Werke*, by H. Mendel (Berlin, 1868).

MEYERHEIM. I. **Friedrich Eduard**, a German painter, born in Dantzic, Jan. 7, 1808. He studied at Berlin, and became a professor in the academy there. Many of his genre pictures, chiefly relating to the life of the peasantry, have been engraved, his "Altenburger in the Corn Field" by himself. His best known picture is a little milkmaid sitting at the roadside counting her earnings, of which there is a chromo-lithograph. II. **Wilhelm Alexander**, his younger brother, excels as a painter of horses, battles, and landscapes, and as an engraver. He exhibited in 1868 "Prince Frederick Charles at Liebenau" and "The King in the Battle of Sadowa." III. **Eduard Franz**, son of Friedrich Eduard, born in Berlin in 1838. He studied under his father, and spent some time in Düsseldorf. Among his genre pictures are "The Polisher of Arms" (1858), "Children with Cats" (1859), "The Love-sick Girl" (1866), and *Dornröschen* and *Schneewittchen* (1870). IV. **Paul Friedrich**, brother of the preceding, born in Berlin in 1842. He studied under his father, and spent over a year in Paris. He has produced many fine genre animal pictures, among others "The Serpent Tamer in the Menagerie," "The Goat Market," and "The Tribunal of Apes." He has made designs for illustrated works, including *Reineke Fuchs* (1870).

MEYERS, a S. county of Dakota, bordering on Nebraska, recently formed, and not included in the census of 1870; area, about 2,850 sq. m. It is drained by the Keya Paha and affluents of White river. The surface consists of undulating prairies and plains.

MEYR, Melchior, a German author, born near Nördlingen, June 28, 1810, died in Munich, April 22, 1871. He studied at Anspach, Augsburg, Munich, and Heidelberg, became known as a poet in 1835 and as a prose writer in 1838, resided in Berlin from 1840 to 1852, and afterward chiefly in Munich. His principal works are his *Erzählungen aus dem Ries* (2 vols., Berlin, 1856-'60; 2d ed., Leipsic, 1868; supplement, Hanover, 1870); *Gott und sein Reich* (Stuttgart, 1860; sequel, *Emilie*, 1863); *Gespräche mit einem Grobian* (Leipsic, 1866; 2d ed., 1867); *Duell und Ehre*, a novel (2 vols., 1870); and the posthumous *Gedanken über Kunst, Religion und Philosophie*, edited by Max count von Bothmer and Moritz Carrière (Leipsic, 1874).

MÉZERAY, François Endes de, a French historian, born at Ry, near Argentan, in 1610, died in Paris, July 10, 1683. He served for two campaigns as commissary in the army, after which he wrote his *Histoire de France* (3 vols., 1643-'51). He received from the king the title of historiographer royal, and a pension of 4,000 livres, which he forfeited in 1668 by publishing an abridgment of his *Histoire* containing severe reflections on French taxation. He was also elected a member of the French academy, and in 1675 its perpetual secretary. His history of France has been continued down to 1830 (Paris, 1839).

MÉZIÈRES, a fortified town of France, capital of the department of Ardennes, on a peninsula formed by the confluence of the Meuse and Vence, and on a branch of the Eastern railway, 125 m. N. E. of Paris; pop. in 1866, 5,818. It has an arsenal, an important magazine, and manufactories of powder and marine projectiles. In the Franco-German war it capitulated in January, 1871.

MÉZIÈRES, Alfred, a French author, born at Rehon, department of the Moselle, Nov. 19, 1826. Like his father, Louis Mézières (born in Paris, Nov. 28, 1793), he has distinguished himself by his writings on English and Italian literature, and he has been since 1864 professor of foreign literature at the Sorbonne. On Jan. 29, 1874, he was elected to the French academy. His *Prédécesseurs et contemporains de Shakespeare* obtained a Montyon prize in 1864, and his *Pétrarque*, written from new documents, received one in 1868. In 1873 appeared his *Goethe, les œuvres expliquées par la vie : Dernières années*.

MEZQUITE (Aztec, *mizquitl*), the Mexican name for *prosopis glandulosa*, which was formerly placed in the genus *algarobia*, a tree of the *mimosæ* suborder of the *leguminosæ*. The mezquite seldom grows more than 30 or 40 ft. high, and when well developed has a rounded head; but owing to the injuries caused by insects and the parasitic mistletoe, the trunk and branches are frequently irregular and distorted. In its foliage it greatly resembles the honey locust (*Gleditsia*), having usually twice-pinnate leaves, which are glandular where the leaflets join the common petiole, and have a pair of strong spines at their insertion upon the stem; the leaflets are narrow, somewhat curved, and an inch or more in length; the small greenish-yellow flowers are crowded in dense axillary spikes 3 to 4 in. long; the pod or bean is 6 in. or more in length, straight or curved, compressed, and somewhat constricted between the numerous seeds. The tree has a wide range, being found as far north as the Canadian river and extending far south into Mexico; it makes its appearance a short distance from the coast in western Texas, and is the most abundant tree as far westward as the Colorado and the gulf of California; it is exceedingly variable, sometimes appearing as a large

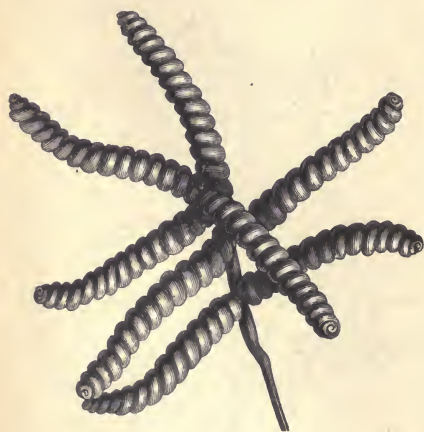
shrub forming dense thickets, which from the abundance of spines are impassable, and at other times growing singly with well developed heads, and when viewed from a distance appearing like an apple orchard, so uniform are the trees in size. Were it not for the mezquite, large tracts in Arizona and northern Mexico would present still greater difficulties to the traveller than they do, as this tree there affords the sole supply of fuel and forage. The wood is very hard, fine-grained, dark reddish brown in the heart wood, and is sometimes used by the Mexicans for furniture, but it is difficult to get pieces large enough to be valuable for lumber; its durability is probably not inferior to that of the locust. As fuel the mezquite has no superior; it makes a hard sonorous coal, a fire of which is almost as intense as one of anthracite; travellers across the desert country where it abounds rely upon it for fuel, the roots being found almost



Mezquite (*Prosopis glandulosa*).

everywhere; where frequent fires destroy the trees the roots remain untouched, throw up a yearly growth of small stems, and thus continue to increase in size, while the growth above ground is destroyed every year or two; it very often happens that a clump of bushes with stems only an inch or two in diameter will lead to the unearthing of roots as large as one's leg. At a profitable silver mine in the state of Chihuahua, visited by the writer several years ago, the smelting of the ore was effected entirely with mezquite roots as fuel. The pods, or beans as they are generally called, at a certain state of maturity contain a sugary pulp, which often has a very pleasant flavor, and when quite ripe is mealy, dry, and highly saccharine, but with a mawkish taste that is to most persons disagreeable, though the Mexicans and Indians are fond of it; the dried pods are beaten in a mortar, and when the seeds and other matters are separated by

sifting a sugary meal is obtained, which is used for sweetening *pinole* (see MAIZE), and otherwise as a substitute for sugar. The great value of the pods is as a food for horses and cattle, which eat them with the greatest avidity; in many places entirely destitute of grass the mezquite beans are most welcome to the traveller. It has been proposed in Utah and Colorado to employ the mezquite as a hedge plant, to which its thorny character would adapt it; but its great liability to be attacked by borers makes the experiment doubtful. The tree exudes a gum resembling gum arabic. (See GUM.)—The plant called by Americans the screw-pod or screw-bean mezquite, and by the Mexicans *tornillo*, is *prosopis pubescens*, to which the name *strombocarpa* has also been given; it has a similar general appearance to the mezquite, but is more slender; its spines are smaller, and its leaves pubescent on the under surface; the pod is curiously twisted to form



Screw Pod of Mezquite.

a close spiral about 2 in. long; this also contains a sweetish pulp, but is less valuable as a food for animals than the mezquite. The tree, which is found from Utah and Nevada southward, is less abundant than the mezquite, and generally prefers a moister soil.

MEZZOFANTI, Giuseppe Gaspardo, an Italian linguist, born in Bologna, Sept. 17, 1774, died in Rome, March 15, 1849. He was educated for the church, and was ordained in 1797. He had an extraordinary memory, and before the close of his university career had mastered the Latin, Greek, Hebrew, Arabic, Coptic, Spanish, French, German, and Swedish languages. At the age of 23 he was appointed professor of Arabic at Bologna; but on the annexation of that city to the Cisalpine republic, he was removed from his professorship for refusing to take the oath to the new constitution. After the conclusion of the concordat between Pius VII. and Napoleon, Mezzofanti was restored to the university, and named professor of oriental

languages. The suppression of his professorship in 1808 left him mainly dependent on private tuition for his own support and that of his sister's children. The wars of which northern Italy was so long the theatre had afforded him many opportunities of extending his knowledge as a linguist. In the hospital of Bologna, to which he had attached himself as volunteer chaplain, were invalids from most of the countries of central and eastern Europe; and while administering to them he acquired a knowledge of their respective languages. In 1812 he was appointed assistant librarian, and in 1815 head librarian of the university of Bologna. After the conclusion of peace, his reputation as a linguist rapidly extended. In 1817 he could read 20 languages and write 18. Lord Byron, whom he is said to have beaten in talking English slang, pronounced him a monster of languages, a Briareus of parts of speech, and a walking polyglot. Having gone to Rome in 1831 as one of a deputation sent by the Bolognese to congratulate Gregory XVI. on his election, he was induced by the pope to accept a prebend in the church of St. John Lateran, and soon afterward a canonry in St. Peter's. In 1833 he succeeded Angelo Mai as chief keeper of the Vatican library, an office which he held till 1838, when he was made a cardinal. During his residence in Rome he gained a knowledge of Irish, Welsh, Lappish, Sanskrit, Persian, Georgian, Armenian, Chinese, and several African tongues. His familiarity with the dialectical varieties and local idioms of the principal languages, as well as with their respective literatures, and his power of passing from one to another in conversation, were almost incredible. At the time of his death he is said to have been acquainted with 114 languages. Mezzofanti, though a learned theologian and canonist, is almost unknown as an author, his only published work being a panegyric "Memoir of Father Emanuel da Ponte," a brother professor (Bologna, 1820). His life has been written by Charles William Russell, D.D., principal of Maynooth college (London, 1858; 2d ed., 1863).

MEZZOTINTO. See ENGRAVING, vol. vi., p. 653.

MIAKO. See KIOTO.

MIALL, Edward, an English journalist, born in Portsmouth in 1809. He was educated in the Protestant dissenters' college at Wymondley, Herts, and for several years officiated as an Independent minister at Ware and Leicesters. In 1841 he established the "Nonconformist" newspaper in London, in the interests of the "anti-state-church" party, and is still its editor and proprietor. He was elected to parliament for Rochdale in 1852, but lost his seat in 1857, and was returned for Bradford in 1869. In parliament he has been a persistent advocate of manhood suffrage and other popular reforms. He has published "The Nonconformist's Sketch Book" and "Views of the Voluntary Principle" (1845); "Ethics of Nonconformity" (1848); "The British Churches

in relation to the British People" (1849); "Bases of Belief" (1853); "Title Deeds of the Church of England to her Parochial Endowments" (1862); "Politics of Christianity" (1863); and "An Editor off the Line, or Wayside Musings and Reminiscences" (1865).

MIAMI, a river of Ohio, which rises in Hardin co., flows S. and S. W. for a distance estimated at 150 m., passing Troy, Dayton, and Hamilton, and falls into the Ohio river at the S. W. corner of the state, 20 m. W. of Cincinnati. It passes through a picturesque and fertile country, is rapid, and admits of navigation for only a portion of its length. Its principal branches are the West branch and the Mad and Whitewater rivers. The Miami canal runs along the river for about 70 m., and together they furnish extensive power for manufacturing.—This river is sometimes called the Great Miami, in distinction from the Little Miami, which rises in Clark co., and after flowing S. W. 100 m., nearly parallel with the former, falls into the Ohio 6 m. E. of Cincinnati.

MIAMI. I. A W. county of Ohio, intersected by the Miami river and drained by its branches; area, about 400 sq. m.; pop. in 1870, 32,740. The surface in the E. part is rolling, in the W. more level, and the soil is very fertile. It is intersected by the Miami and Erie canal, and by the Pittsburgh, Cincinnati, and St. Louis and the Dayton and Michigan railroads. The chief productions in 1870 were 858,886 bushels of wheat, 1,293,096 of Indian corn, 379,415 of oats, 71,804 of barley, 82,521 of potatoes, 40,221 of flax seed, 206,704 lbs. of flax, 71,529 of tobacco, 55,181 of wool, 489,132 of butter, and 11,531 tons of hay. There were 8,126 horses, 6,208 milch cows, 7,796 other cattle, 16,127 sheep, and 19,414 swine; 1 manufactory of agricultural implements, 11 of brick, 18 of carriages and wagons, 6 of lime, 2 of machinery, 9 of marble and stone work, 3 of linseed oil, 5 of sash, doors, and blinds, 3 of woollen goods, 3 iron foundries, 18 flour mills, 8 saw mills, 5 tanneries, 4 distilleries, and 4 breweries. Capital, Troy.

II. A N. county of Indiana, intersected by the Wabash and Eel rivers; area, 384 sq. m.; pop. in 1870, 21,052. It has a generally level surface, with elevations near the streams, and a fertile soil. It is intersected by the Toledo, Wabash, and Western, and several other railroads. The chief productions in 1870 were 484,817 bushels of wheat, 417,930 of Indian corn, 100,757 of oats, 61,687 of potatoes, 66,643 lbs. of wool, 372,457 of butter, and 17,560 tons of hay. There were 6,509 horses, 5,111 milch cows, 7,156 other cattle, 20,706 sheep, and 20,794 swine; 5 manufactories of agricultural implements, 18 of carriages, 5 of saddlery and harness, 3 of cigars, 2 of woollen goods, 2 iron foundries, 33 saw mills, 9 flour mills, and 1 brewery. Capital, Peru. **III.** An E. county of Kansas, bordering on Missouri, and intersected by Osage river; area, 576 sq. m.; pop. in 1870, 11,725. It is traversed by

the Missouri river, Fort Scott, and Gulf railroad, and by the Osage division of the Missouri, Kansas, and Texas line. The surface is undulating and the soil productive. The greater portion of the county is prairie, but there is considerable woodland. The chief productions in 1870 were 54,596 bushels of wheat, 764,145 of Indian corn, 268,500 of oats, 71,242 of potatoes, 11,243 lbs. of wool, 240,323 of butter, and 14,147 tons of hay. There were 4,913 horses, 4,774 milch cows, 7,385 other cattle, 3,929 sheep, 7,756 swine, and 8 saw mills. Capital, Paola.

MIAMIS, an Indian tribe of the Algonquin family. They comprised the Ouataton or Wea, Peanguichia or Piankeshaw, Pepikokia, Kilatak, and other bands. They were found by the French in 1658 near Green bay, and in 1670 Allouez found a large village at the head of Fox river, under Tetenchoua, a chief who had a body guard and was treated with a respect unusual in the northern tribes. They then numbered 8,000 warriors, according to some accounts, lived in mat houses within a palisade, and were brave, civil, and well disposed. A large body soon after congregated on the St. Joseph's river. In 1683 they and their kindred the Illinois were attacked by the Iroquois; they maintained the war vigorously, although at the same time fighting the Sioux on the west. The presence of some French traders among the Sioux in 1686 brought them into collision with the French, and they nearly burned Nicolas Perrot at the stake. They sent a detachment to swell Denonville's army, but began then to be very restless, joined the Iroquois against the Hurons, menaced the Chipewas, and opened intercourse with the English. Their losses in war were heavy; a whole village was carried off by the Sioux in 1700. In 1705, trouble having arisen between the Miamis and the Ottawas at Detroit, the former attacked the latter, and a general engagement ensued, the French officers having precipitated the war. Cadillac finally marched against the Miamis in 1707, but made a hollow peace which increased their insolence. They had at this time retired temporarily from Chicago and from the St. Joseph's river. In 1721 the Miamis were on the St. Joseph's and the Miami, and the Wea band on the Wabash or Ohio. When the final struggle between England and France approached, they wavered; they attacked the Senecas, but met the English colonists at Lancaster, plundered the French posts, and allowed an English fort to be erected on their lands. In 1751 the French attacked them, killing several English and Indians. After the fall of the French power they prevented the English troops from crossing their country, but finally made peace, though they joined Pontiac and captured the British forts Miami and St. Joseph's. During the revolution they sided with England; but when Clarke reduced Illinois and took Hamilton prisoner, and their own towns were ravaged, they made peace. A

hostile feeling remained against the advancing settlements. Hostilities prevailed for several years, and finally Gen. Harmar was sent against them in 1790. At this time they could put in the field 1,500 warriors. Led by Mishekonequoh or Little Turtle, they defeated Col. Hardin, Oct. 19, and again at the Maumee on the 21st. The next year the towns of the Weas, who were rapidly becoming civilized, were destroyed by Gen. Scott, but the main army under Gen. St. Clair was utterly routed by Little Turtle, Nov. 4, 1791, with the loss of 39 officers and 593 men killed. A treaty was made the next year by Rufus Putnam, but the senate refused to confirm it. The Miamis continued the war; but having been disastrously defeated by Wayne under the guns of an English fort at Maumee rapids, Aug. 20, 1794, they made peace at Greenville in 1795. After that they rapidly declined. By a series of treaties between that date and 1809 they ceded lands extending from the Wabash to the Ohio state line, and the annuities proved fatal, introducing intoxication, indolence, and violence. When Tecumseh began his movement the Miamis refused to join it; but as the war with England went on, the tribe was gradually drawn in, and at last refused to attend the Americans in council. Gen. Harrison sent Lieut. Col. Campbell against them, and though, following their usual tactics, they assailed his line, he finally defeated them. The Miamis then sued for peace, and a treaty was made Sept. 8, 1815. War had broken up the progress they had made, and drunkenness again prevailed, leading to fights in which nearly 500 perished in 18 years. In 1822 they numbered between 2,000 and 3,000, on three reservations, and the Baptists were making an effort to save them. The Wea and Piankeshaw bands, numbering 384, were removed in 1834-5 to a reservation of 160,000 acres on the south side of Kansas river, and in 1838 the Miamis, then 1,100 in number, sold to government 177,000 acres in Indiana for \$335,680, still retaining a large tract. By the treaties of 1838 and 1840 they ceded all, and in 1846 were removed to the Marais des Cygnes in the Fort Leavenworth agency. They had dwindled to a wretched dissipated band of 250; each individual received an annuity of about \$125. Their decline continued, the civil war in Kansas exposing them to encroachments of every kind. A few Miamis and some of the Weas, under the influence of Baptiste Peoria, reformed and made some progress; but when the remnants were removed to the Quapaw reservation about 1873, they did not number more than 150.

MIANTONOMOH, a sachem of the Narragansetts, nephew of Canonicens, whom he succeeded in 1636. He maintained friendly relations with Massachusetts, and in 1637 aided in chastising the Pequots. Sequasson, one of his chiefs, having been attacked in 1642 by Uncas, the Mohegan, Miantonomoh with the consent of the governor of Hartford marched against Uncas with nearly 1,000 men, but was defeat-

ed and taken prisoner at Norwich. The victor took his captive to Hartford and left his fate in the hands of the commissioners of the United Colonies, who advised his execution. He was tomahawked in 1643 on Sachem's plain, the field where he was defeated. A monument was erected on the spot in 1841.

MIASMA. See **MALARIA**.

MIKAULIS, Andros, a Greek admiral, born in the island of Negropont about 1770, died in Athens, June 23, 1835. His father, Demetrius Vokos, owned a felucca (Turk. *miawl*), and put his son in charge of it, whence his surname. The latter settled at Hydra, where successful commercial enterprise gave him influence. He joined the Greek revolution in 1821, and in 1822 became commander-in-chief of the national fleet. In the same year he defeated the Turks at Patras (March) and Spezzia (September); and in May, 1825, he burned Ibrahim Pasha's squadron at Modon, and inflicted further damage on the enemy's fleet. In 1827, soon after Lord Cochrane's appointment as head of the navy, he retired from the service; but Capo d'Istria reinstated him and placed him also in charge of the port of Poros. After remonstrating in vain against the neglect of the navy, he joined the insurrectionary government at Hydra in 1831, and burned the Greek ships at Poros (Aug. 13), to prevent them from being seized by the Russians. He was arraigned for treason by Capo d'Istria, whose death (Oct. 9, 1831) put an end to the proceedings. In the following year Mikaulis was placed at the head of all the naval stations in the Archipelago. In 1832 he was a member of the deputation sent to Munich to offer the throne of Greece to Otho. Shortly before his death he was made vice admiral.—His son **ATHANASIOS** was prime minister of Greece from 1855 to 1862, and his administration contributed largely to the overthrow of King Otho. He died in Paris in May, 1867.

MICA (Lat. *micare*, to sparkle), in mineralogy, the name of a group of the silicates, distinguished by their remarkable lamellar structure, the elasticity of their laminae, and their half metallic lustre. The minerals crystallize in right rhomboidal prisms of 120°, which separate with the greatest facility in foliae parallel with the base of the crystal. These may be subdivided till many thousand plates are required to make the thickness of an inch. They are found usually transparent, elastic, and tough. The colors are various; the most common are silvery white, grayish green, red, and black. The hardness of the mineral is 2 to 3; specific gravity 2.65 to 3.3. The different species are distinguished partly by their different optical characters as well as by their differences of composition. They present two axes of double refraction, which, in the species designated by Dana as muscovite, and commonly known as Muscovy glass, vary in apparent inclination between 44° and 75°; in the phlogopites, called also rhombic mica and magnesite mica in part, from 5° to 20°; and in

the biotites below 5°. Prof. B. Silliman, jr., observes that the muscovites are confined to granitic and other igneous rocks, and the phlogopites to granular limestone and serpentine. The former generally contain potash or lithia and little magnesia, and the latter contain magnesia, and often but little alkali. The composition of the most common micas, according to Dufrenoy, is from 45 to 50 per cent. of silica, 32 to 38 of alumina, 10 to 15 of alkali (rarely soda), and 2 to 4 of fluoric acid. He considers the differences of composition too great to admit of any general formula. The micas are silicates, containing, besides silica and fluorine, alumina, iron, magnesia, potash, lithia, rubidia, and caesia, the magnesia generally failing in the varieties found in the granitic rocks. Lepidolite is a species distinguished for its occurrence usually in granular masses made up of foliated scales of rose-red color, violet gray, yellowish, or whitish. Muscovite, the most familiar form of mica, is a constituent of granite, gneiss, mica slate, and some other kindred rocks. It is found both disseminated and in veins, and in many of the stratified rocks it is an incidental constituent derived from the destruction of the original formations to which it belonged. The mineral is thus seen to be very generally distributed; but certain localities are distinguished for the production of large plates of it. In Siberia they have been found more than 3 ft. across, and they have been obtained of great size in Sweden and Norway. This is also the case at Acworth, Grafton, and Alstead, N. H.; and mica has been found in some of the other states and in Canada sufficiently large to be quarried for economical purposes. Mica is used mostly for the doors of stoves and the sides of lanterns, for which it is well adapted by its transparency and refractory character. It has been used as a substitute for window glass, and its toughness recommends it for this purpose on board vessels of war, in which the concussion from the discharge of heavy guns might occasion the fracturing of glass. It has also been used for spectacles, optical instruments, and bronzing powder, and is serviceable for holding small objects for microscopic examination. Very extensive mica mines were discovered in Mitchell co., N. C., in 1867, which have since been extensively worked. They had evidently been worked centuries ago.

MICAH, one of the 12 minor prophets, who, according to the testimony of his book (i. 1), prophesied in the days of Jotham, Ahaz, and Hezekiah, kings of Judah (about 759-698 B. C.). He was a native of Moresheth of Gath. The prophecy of Micah consists of two parts, the first of which terminates with chapter v. It begins with a sublime theophany, the descent of the Lord to judge the nations of the earth, and then denounces the iniquities of the two Hebrew kingdoms, especially of the rulers and prophets, predicts the captivity of Israel, the fall of Judah, the destruction of Jerusalem, the

expatriation of the Jews, their return, and the celebrity of the temple of Zion. Bloody wars are seen in the perspective, and after many calamities a ruler is seen to come forth from Bethlehem (v.). The second part consists of a discussion or controversy between the Lord and his people. The authenticity of the book is generally recognized; only the last two chapters have been ascribed by Ewald to a younger prophet. The style of Micah is sublime and vehement. Among the principal critical writings on Micah are those of Caspari, *Micah der Moraschite und seine prophetische Schrift* (Christiania, 1851); Hitzig, *Kleine Propheten* (3d ed., 1863); and Ewald, *Propheten* (vol. i., 1867).—Micah, or Micaiah, was also the name of another prophet mentioned in the history of Ahab, king of Israel (1 Kings xxii. 8-28).

MICALI, Giuseppe, an Italian archaeologist, born in Leghorn about 1776, died in Florence, March 28, 1844. He travelled extensively, and devoted himself to archaeological studies. His *Italia avanti il dominio de' Romani* (4 vols., Florence, 1810, with a map and 67 plates; new ed., 1831), won a prize, but incurred criticism, which induced the author to remodel it under the title *Storia degli antichi popoli italiani* (3 vols., 1832; 2d ed., Milan, 1836; enlarged ed., 4 vols., Florence, 1843 *et seq.*; translated into French by Raoul Rochette). It was followed by *Monumenti antichi*, a volume containing 120 plates (Florence, 1844).

MICA SLATE, a very abundant metamorphic rock, consisting of mica and quartz, and sometimes feldspar, in which the mica predominates, and by its arrangement in parallel planes gives to the aggregate a foliated structure. It belongs to the mica-bearing series, of which granite and gneiss are also members. Some authors classify it under the same head with mica schist, while others place it midway between mica schist and clay slate. What is called mica schist sometimes contains numerous garnets imbedded in it, when it receives the name of garnet schist. It is prevalent along the banks of the Tay and about Dunkeld in Scotland, and also in the Blue Ridge mountains in the United States.

MICHAEL (Heb., who is as God), the angel who had special charge of the Israelites as a nation (Dan. x. 13, 21), who disputed with Satan about the body of Moses (Jude 9), and who with his angels carried on war with Satan and his angels in the upper regions (Rev. xii. 7-9). The Jews regarded Michael as one of the archangels, and the Christian church early adopted this view. The representation of Michael, sword in hand, conquering the dragon, became a favorite symbol in the Roman Catholic church. A festival of St. Michael was introduced by Pope Felix III. (483-92), and it was retained also in the Lutheran church. Mohammedans regard Michael likewise as one of the archangels, and as guardian angel of the Jews.

MICHAEL ANGELO. See BUONAROTTI.

MICHAEL PALÆOLOGUS. See BYZANTINE EMPIRE, vol. iii., p. 517.

MICHAEL ROMANOFF. See RUSSIA.

MICHAELIS, Johann David, a German Biblical scholar, born in Halle, Feb. 27, 1717, died in Göttingen, Aug. 22, 1791. He graduated at Halle in 1739, and in 1743 began to deliver lectures there on the historical books of the Old Testament. In 1745 he was appointed professor of philosophy at Göttingen. For nearly 20 years he edited the *Göttinger gelehrte Anzeigen*. His principal works are: a translation of the Hebrew Bible; "Introduction to the New Testament," translated into English by Bishop Marsh; and *Das Mosaische Recht* (2d ed., 5 vols., Göttingen, 1776-'80), translated into English by Dr. Alexander Smith, under the title of "Commentaries on the Laws of Moses" (4 vols., London, 1814).

MICHAELMAS, the feast of St. Michael the Archangel, Sept. 29. It is more celebrated for popular customs connected with it than for any peculiar religious observance. It was an old custom in England to mark the day by electing civil magistrates, perhaps in allusion to the analogy between the superintendence of magistrates and that of guardian angels, of whom St. Michael was reputed the prince. A more famous custom is that of eating roast goose, which has been traced at least as far back as 1471; and it is said that one of the strongest objections of the English commonalty to the reformation of the calendar was based on the confusion which would follow if Michaelmas day was not celebrated when stubble geese are in their highest perfection.

MICHAUD, Joseph, a French author, born at Albens, Savoy, June 19, 1767, died in Passy, Sept. 30, 1839. In 1791 he published a *Voyage littéraire* to Mont Blanc and the adjoining regions, followed by an oriental tale entitled *Origine poétique des mines d'or et d'argent*, neither of which attracted much notice. He next became a defender of the monarchy; and for publishing an anti-revolutionary satire entitled *Déclaration des droits de l'homme*, he was obliged for a time to conceal himself. In September, 1792, he established *La Quotidienne*, a daily journal in the royalist interest, the character of the articles in which caused him to be condemned to death, but the efforts of his friend Giguët preserved him from the guillotine. Adhering steadily to his opinions under the directory, he was banished after the 18th Fructidor (Sept. 4, 1797), and took refuge among the Jura mountains, whence he returned to France in November, 1799. He opposed the consulate with no less acrimony than he had shown toward the convention and the directory; and for an anonymous pamphlet, *Adieux à Bonaparte* (Paris, 1800), he was confined for a short time in the Temple. In 1801 appeared his *Histoire des progrès et de la chute de l'empire de Mysore, sous le règne d'Hyder Ali et de Tippu Saïb* (2 vols. 8vo), followed by the *Biographie moderne* (4 vols. 8vo, Leipsic,

1802), printed in Paris by the brothers Michaud, a publishing firm established at the commencement of the century by himself, his brother Louis Gabriel, and Giguët. This publication was the germ of the later and more elaborate work, the *Biographie universelle*, published by the same house. In 1803 he published *Le printemps d'un proscrit*, a poem written during his exile, which passed through many editions. His royalist views changed, and in 1810 he addressed a congratulatory poem to Napoleon on occasion of his marriage with Maria Louisa, under the title of *Fragment d'un treizième livre de l'Enéide*, and another in 1811 commemorating the birth of the king of Rome. His most important work, *Histoire des croisades* (1811 et seq.) went through five editions in his lifetime, the last being in 1840-'41 (6 vols. 8vo), and has been translated into the principal languages of Europe. He published an abridgment of it (2 vols. 12mo, 1838), and in further illustration of the subject produced the *Bibliothèque des croisades* (4 vols.), and *Correspondance d'Orient* (7 vols.), the latter a record of his extensive travels in company with his pupil, Poujoulat, through those portions of the East traversed by the crusaders. After the overthrow of the empire Michaud reestablished the *Quotidienne*, but during the hundred days it became a mere vehicle of news. He published an account of the hundred days, of little historical value, which passed through 27 editions, and continued until the close of his life, in spite of feeble health, to devote himself to historical researches. Among his last publications were an edition of Hénault's *Abrégé chronologique de l'histoire de France*, with a continuation to July, 1830, and a *Collection de mémoires pour servir à l'histoire de France*, which was commenced in 1836, in conjunction with Poujoulat, and published in 34 vols. 8vo. His name has been most popularly associated with the *Biographie universelle*, published between 1811 and 1828, which, with its supplement, 1834-'40, comprised 85 vols. 8vo. He was a member of the French academy and of the academy of belles-lettres, and held other positions of honor and emolument.—His brother LOUIS GABRIEL, known as Michaud the younger (born in Bourg in 1773), had a large share in editing and writing the *Biographie universelle*, and commenced a new edition (vol. i., 1854), which was completed after his death (March 12, 1858) in 45 volumes. He also wrote several historical and biographical works.

MICHAUX. I. André, a French botanist, born in Versailles, March 7, 1746, died in Madagascar, Nov. 13, 1802. He studied under Bernard de Jussieu, and was afterward a pupil at the *jardin des plantes*, and an associate of Lamarck and Thouin in their botanizing excursions. After travelling in the Pyrenees and Spain he accompanied the French consul to Persia, and remained in the East for two years making botanical collections and observations. In the "garden of Semiramis" near Bagdad

he discovered a Persepolitan monument, which he sent to the cabinet of antiquities in the royal library at Paris. Commissioned by the French government in 1785 to make a journey through North America, he traversed a great part of the continent from Florida to Hudson bay, established botanic gardens near Charleston and New York, and sent home an immense quantity of plants and seeds. The New York garden was really in Bergen co., N. J. The government allowance for the expense of this undertaking having ceased at the revolution, he made use of his private purse until it was exhausted. On his voyage home he was shipwrecked and lost all that he possessed except four cases of specimens. He reached home in 1796, and found that the plantations to which he had contributed 60,000 young trees had been destroyed during the revolution. In 1800 he joined the expedition to Australia under Capt. Baudin, but left it at the Isle of France, and went to Madagascar, where he was attacked by fever and died. He left an *Histoire des chênes de l'Amérique Septentrionale* (fol., Paris, 1801), and *Flora Boreali-Americana* (2 vols. 8vo, 1803). **II. François André**, a French botanist, son of the preceding, born in Versailles in 1770, died at Vauréal, near Pontoise, Oct. 23, 1855. He was employed by the French government on a scientific mission to North America, to decide what species of the forest trees of that country might profitably be introduced into Europe, and made three voyages to the United States, whence he sent to France large quantities of valuable seeds. His principal work is *Histoire des arbres forestiers de l'Amérique Septentrionale* (4 vols. 8vo, Paris, 1810-13), of which an English translation by the author was published in Paris and Philadelphia (4 vols. 8vo, 1817-19), and another edition, translated by Hillhouse (Philadelphia, 1830). Three supplementary volumes were added by Thomas Nuttall in 1842-9, which contained the trees not included in Michaux's work, and the whole is now published in five volumes, two by Michaux and three by Nuttall. He also published *Mémoire sur la naturalisation des arbres forestiers de l'Amérique* (Paris, 1805), and *Voyage à l'ouest des monts Alleghanies* (1804; English translation, London, 1805).

MICHEL, Francisque Xavier, a French archæologist, born in Lyons, Feb. 18, 1809. He began his literary career in Paris as a writer for the journals, and in 1832 published two historical novels, *Job* and *Audefrois le bâtard*. His chief attention, however, was given to philosophical researches, and between 1830 and 1833 he edited several publications written in mediæval French, including *La chronique de Du Guesclin*, *Les chansons de Coucy*, *Le lai d'Havelok le Danois*, &c. In 1835 he was commissioned by Guizot, then minister, to make researches into early French history and literature among the libraries of England, and in 1839 he was appointed professor of foreign

literature in the faculty of Bordeaux. Between 1834 and 1842 he published in London or Paris more than 30 works in French, Saxon, or English, written between the 11th and 14th centuries, many of which were then printed for the first time. Among the most important are: the *Roman d'Eustache le Moine* (1834); *Tristan*, a collection of poems of the 12th and 13th centuries in French, Anglo-Norman, and Greek (2 vols. 12mo, London, 1835); *Chroniques anglo-normandes* (3 vols. 8vo, Rouen, 1836-40), illustrating the history of England and Normandy during the 11th and 12th centuries; *La chanson de Roland* (1837); *Chroniques des ducs de Normandie* (4 parts, 1837-40), by the troubadour Benoit; *La chanson des Saxons*, by Jean Bodel (2 vols. 8vo, 1839-40), a narrative of the life of Wittekind; "Chronicle of the War between the English and the Scots in 1173 and 1174" (1840); *Histoire des ducs de Normandie et des rois d'Angleterre* (1840); and *Le roman du Saint-Graal*, in verse (1841). He has also produced several original works of considerable erudition, including his *Histoire des races maudites de la France et de l'Espagne* (2 vols. 8vo, 1847); *Le livre d'or des métiers* (2 vols. 8vo, 1851-4); *Histoire des tissus de soie au moyen âge* (2 vols. 4to, 1852-4); *Le pays Basque* (1857); *Les Écossais en France et les Français en Écosse* (1862); and *Histoire du commerce et de la navigation à Bordeaux, principalement sous l'administration anglaise* (1867). He has translated several English works.

MICHEL ANGELO. See BUONAROTTI.

MICHELET, Jules, a French historian, born in Paris, Aug. 21, 1798, died at Hyères, Feb. 9, 1874. He studied in the collège Charlemagne, and after travelling in Germany was called in 1821 to the chair of history in the collège Rollin, where he was also professor of the ancient languages and of philosophy till 1826, publishing in that period his *Tableau chronologique de l'histoire moderne* (1825), and *Tableaux synchroniques de l'histoire moderne* (1826). In 1827 he was made *maître des conférences* in the normal school, and in 1830 chief of the historical section of the archives of France. In that year Guizot, who was diverted from literature to politics, chose him to continue his lectures in the faculty of letters. His reputation was extended by a series of historical works, and in 1838 he was appointed to the chair of history in the collège de France, and elected a member of the institute. Among his publications are: *Précis de l'histoire moderne* (1828); *Introduction à l'histoire universelle* (1831); a translation of Vico's *Scienza nuova*, under the title of *Principes de la philosophie de l'histoire* (1831); *Histoire romaine* (1831); *Mémoires de Luther* (1833); and *Précis de l'histoire de France jusqu'à la révolution française* (1833). In 1833 appeared the first portion of his most important work, the *Histoire de France* (16 vols. 8vo, completed in 1867). His academical lectures were distinguished for

appeals in favor of democratic ideas and for assaults upon the Jesuits. He embodied these tendencies in three books: *Des Jésuites* (1843), in collaboration with Quinet; *Du prêtre, de la femme et de la famille* (1844); and *Du peuple* (1846). The government of Louis Philippe suspended his course. He was restored to his chair after the revolution of 1848, again declined public office as he had done in 1830, and gave to his lectures the design and character of democratic propagandism, till his course was closed by the government of Louis Napoleon in March, 1851. He lost his place in the archives after the *coup d'état* of Dec. 2, 1851, by refusing to take the oath. He published the *Procès des templiers* (2 vols., 1841-'52), a collection of unprinted documents, and *Origines du droit français cherchées dans les symboles et formules du droit universel* (1837), founded upon Grimm's work on German antiquities. After his retirement he published a series of volumes entitled *L'Oiseau* (1856), *L'Insecte* (1857), *L'Amour* (1858), and *La femme* (1859), remarkable for their poetical and suggestive speculations. The last two were translated into English by J. W. Palmer, M. D. (New York, 1859 and 1860). The *Histoire de la révolution française* (6 vols., 1847-'53), and *Les femmes de la révolution* (1854), form distinct works. His later works are: *La sorcière* (1862); *La Pologne martyre* (1863); *La Bible de l'humanité* (1864); *La Montagne* (1868); *Nos fils*, advocating compulsory education (1869); and *Histoire du XIX^{me} siècle* (1872). His more important publications have all appeared in English.—His second wife, ATHANASE MICHELET, who survives him, had been a teacher in St. Petersburg. She opened a correspondence with him arising from her ardent admiration of his ideas, and they became engaged before they had seen each other. She assisted him in his labors, and was preparing a new work, *La nature*, at the time of his death.

MICHELET, Karl Ludwig, a German philosopher, born in Berlin, Dec. 4, 1801. He was educated at the university of Berlin, receiving the degree of Ph. D. in 1824. The principles contained in his inaugural dissertation were developed in his *System der philosophischen Moral* (Berlin, 1828). In 1825 he was appointed professor of philology and philosophy in the French gymnasium, which post he held till 1850; and in 1829 he became professor of philosophy also in the university of Berlin. He published *Die Ethik des Aristoteles* (Berlin, 1827), an edition of the Nicomachean ethics with a Latin commentary (2 vols., 1829-'35), and a memoir entitled *Examen critique du livre d'Aristote intitulé Métaphysique* (Paris, 1836), which was crowned by the academy of moral and political sciences of Paris. From 1832 to 1842 he was engaged as one of the editors of Hegel's works, in illustration of whose system he wrote *Geschichte der letzten Systeme der Philosophie in Deutschland von Kant bis Hegel* (2 vols., Berlin, 1837-'8);

Entwicklungsgeschichte der neuesten Deutschen Philosophie mit besonderer Rücksicht auf den gegenwärtigen Kampf Schelling's mit der Hegelschen Schule (1843); and a controversial dissertation, *Schelling und Hegel* (1839). In 1840 appeared his *Anthropologie und Psychologie*, in which in many respects he diverged from Hegelian principles. His own tendency is most decisively shown in his *Vorlesungen über die Persönlichkeit Gottes und die Unsterblichkeit der Seele, oder die ewige Persönlichkeit des Geistes* (1841), and *Die Epiphanie der ewigen Persönlichkeit des Geistes* (1844-'52). He has also published *Eine italienische Reise in Briefen* (Berlin, 1856); *Die Geschichte der Menschheit in ihrem Entwicklungsgange seit dem Jahre 1775 bis auf die neuesten Zeiten* (2 vols., 1859-'60); and *Naturrecht, oder Rechtsphilosophie als die praktische Philosophie* (3 vols., 1866). Since 1860 he has edited and largely contributed to *Der Gedanke*, the organ of the philosophical society of Berlin.

MICHELIS, Friedrich, a German theologian, born in Münster, July 27, 1815. He was ordained as a priest at Münster, became a private tutor, and held various positions till 1864, when he was appointed professor of philosophy at the lyceum of Braunsberg. In his writings he attempts to reconcile the teachings of Plato and those of modern science with the doctrines of the church of Rome, and in 1866-'7 he was prominent in the Prussian chamber as an opponent of Bismarck's ecclesiastical policy. But he opposed the influence of the Jesuits and the dogma of papal infallibility in several pamphlets (1869-'70), which led to his excommunication. His principal work is *Die Philosophie Platon's in ihrer innern Beziehung zur geoffenbarten Wahrheit* (2d part, Münster, 1859-'60); his latest is *Der Organismus und die Kirche* (Bern, 1874). He has written much against Darwin's theories. For some time he has been editor of *Der Katholik*, an organ especially directed against the Jesuits.

MICHIGAN, one of the western states of the American Union, and the 13th admitted under the federal constitution, situated between lat. 41° 45' and 48° 20' N., and lon. 82° 25' and 90° 34' W. It is bounded N. by Lake Superior; E. by St. Mary's strait or river, Lake Huron, St. Clair river, Lake St. Clair, the Detroit river, and Lake Erie; S. by Ohio and Indiana; and W. and S. W. by Lake Michigan and the Menominee and Montreal rivers, with the chain of lakes lying between their head waters. The bounding waters (except Lake Erie) on the north and east separate it from the province of Ontario, Canada; those on the west and southwest from Illinois and Wisconsin. The land area of the state is 56,451 sq. m. It is divided into 77 counties, viz.: Alcona, Allegan, Alpena, Antrim, Barry, Bay, Benzie, Berrien, Branch, Calhoun, Cass, Charlevoix, Cheboygan, Chippewa, Clare, Clinton, Crawford,* Delta, Eaton, Emmet, Genesee, Gladwin,* Grand Traverse, Gratiot, Hillsdale, Houghton,

Huron, Ingham, Ionia, Iosco, Isabella, Jackson, Kalamazoo, Kalkaska, Kent, Keweenaw, Lake, Lapeer, Leelanaw, Lenawee, Livingston, Mackinaw, Macomb, Manistee, Manitou, Marquette, Mason, Mecosta, Menominee, Midland, Missaukee, Monroe, Montcalm, Montmorency,* Muskegon, Newaygo, Oakland, Oceana, Ogemaw,* Ontonagon, Osceola, Oscoda,* Otsego,* Ottawa, Presque Isle, Roscommon,* Saginaw, Sanilac, Schoolcraft, Shiawassee, St. Clair, St. Joseph, Tuscola, Van Buren, Washtenaw, Wayne, and Wexford. There are 38 cities, as follows: Detroit, the commercial metropolis of the state, having a population in 1874 of 101,255; Grand Rapids, 25,923; East Saginaw, 17,084; Jackson, 13,859; Bay City, 13,690; Saginaw City, 10,064; Adrian, 8,863; Muskegon, 8,505; Port Huron, 8,240; Flint, 8,197; Lansing (the capital), 7,445; Ann Arbor, 6,692; Monroe, Battle Creek, Marquette, and Ypsilanti, having each more than 5,000 inhabitants; Manistee, Ishpeming, Marshall, Niles, Grand Haven, and



State Seal of Michigan.

Coldwater, with more than 4,000 each; Alpena, Negaunee, Hillsdale, Pontiac, Wyandotte, Ionia, Greenville, and Big Rapids, with more than 3,000 each; Lapeer, Charlotte, Holland, Owosso, Ludington, Hastings, and St. Clair, with more than 2,000 each; and Corunna, with a population of 1,345. The principal villages are Kalamazoo (pop. in 1870, 9,181), Allegan, Escanaba, Fenton, Houghton, Hudson, Sault Ste. Marie, and Tecumseh.—The population of Michigan at the several federal decennial enumerations since its organization as a territory has been as follows:

YEARS.	White.	Colored.	Total.
1810.....	4,613	144	4,762
1820.....	8,591	206	8,896
1830.....	31,346	261	31,639
1840.....	211,560	707	212,267
1850.....	395,071	2,583	397,654
1860.....	736,142	6,799	742,113
1870.....	1,167,282	11,549	1,184,059

* Unorganized.

The population in 1800 was 551; at the several territorial and state censuses it has been as follows: 1834, 87,278; 1854, 509,374; 1864, 803,745; 1874, 1,334,031. Included in the total for 1870 are 4,926 Indians, 1 Chinaman, and 1 Japanese. In that year Michigan ranked 13th among the states in point of population, the gain since 1860 being 58.06 per cent. Of the inhabitants, 916,049 were native and 268,010 foreign born, 617,745 males and 566,314 females. Of the natives, 507,268 were born in the state, 231,509 in New York, 62,207 in Ohio, 28,507 in Pennsylvania, 14,445 in Vermont, 12,140 in Indiana, 10,839 in Massachusetts, 8,033 in New Jersey, 7,412 in Connecticut, 6,055 in Illinois, 5,986 in Wisconsin, 3,932 in Maine, 3,633 in New Hampshire, 1,984 in Virginia and West Virginia, 1,719 in Kentucky, 1,486 in Iowa, 1,265 in Maryland, and 1,137 in Rhode Island. There were 65,720 persons born in the state living in other states and territories. Of the foreign population, 89,590 were born in British America, 64,143 in Germany, 42,013 in Ireland, 35,051 in England, 12,559 in Holland, 8,552 in Scotland, 3,121 in France, 2,406 in Sweden, 2,116 in Switzerland, 1,516 in Norway, 1,854 in Denmark, and 1,179 in Bohemia. There were in the state 274,459 male citizens of the United States 21 years old and upward. The number of families was 241,006, with an average of 4.91 persons to each; of dwellings, 237,036, with an average of 5 persons to each. There were 34,613 persons 10 years old and over who could not read, and 53,127 who could not write, of whom 22,547 were natives and 30,580 foreigners, 48,649 whites, 2,655 colored, and 1,823 Indians. Of the white and colored, 24,706 were males and 26,598 females; 8,391 were between 10 and 15 years of age, 5,428 between 15 and 21, and 37,485 (18,558 males and 18,927 females) 21 and over. The number of blind persons was 418; of deaf and dumb, 455; of insane, 814; of idiotic, 613. The number of paupers supported during the year ending June 1, 1870, was 3,151, at a cost of \$269,682; number receiving support on that date, 2,042, of whom 1,189 were foreigners. The number of persons convicted of crimes during the year was 835; number in prison June 1, 1,095, of whom 416 were foreigners. Of the 404,164 persons (346,717 males and 57,447 females) 10 years old and upward returned as engaged in all occupations, there were employed in agriculture 187,211, including 121,558 farmers and planters and 64,885 agricultural laborers; in professional and personal services, 104,728, including 1,430 clergymen, 49,005 domestic servants, 36,034 laborers, 1,167 lawyers, 1,722 government employees and officials, 2,034 physicians and surgeons, and 5,059 teachers; in trade and transportation, 29,588; and in manufactures and mining, 82,637, including 4,730 blacksmiths, 3,535 brick and stone masons, &c., 1,799 car, carriage, and wagon makers, 14,693 carpenters and joiners, 2,045 cotton and woollen mill operatives, 1,075

fishermen, 1,314 iron and steel workers, 2,341 lumbermen, raftsmen, and wood choppers, 1,180 machinists, 1,585 millers, 3,426 miners, 2,727 painters and varnishers, and 10,356 saw-mill operatives. The tribal Indians of Michigan in 1874 numbered 8,923, viz.: Ottawas and Chippewas, 6,170; Chippewas of Saginaw, Swan creek, and Black river, 1,575; Chippewas of Lake Superior, 1,118; and Pottawattomies of Huron, 60. The Ottawas and Chippewas reside in the N. part of the southern peninsula and on the islands of Lake Michigan; the Chippewas of Saginaw, &c., in Isabella co.; the Pottawattomies in Calhoun co.; the Chippewas of Lake Superior on L'Anse bay in Houghton co. The last named tribe depend for subsistence chiefly upon hunting and fishing; the others are largely engaged in agriculture. They are well advanced in civilization, mostly hold land in severalty, and are entitled to the privileges of citizenship. The agent of the Michigan Indians is nominated by the Methodists. There are several schools among them under the auspices of the Roman Catholics and Methodists.—Michigan consists of two irregular peninsulas, which are separated from each other by the strait of Mackinaw (4 m. wide) connecting the N. ends of Lakes Michigan and Huron. The upper or northern peninsula is bounded N. by Lake Superior, E. by St. Mary's strait, S. by Lake Huron, the strait of Mackinaw, and Lake Michigan, and S. W. by Wisconsin. It is 318 m. in greatest length from E. to W., and from 30 to 164 m. wide, embracing about two fifths of the area of the state. It comprises the counties of Chippewa, Delta, Houghton, Keweenaw, Mackinaw, Marquette, Menominee, Ontonagon, and Schoolcraft, and contains but a small portion of the population (61,814 in 1874). From its W. extremity the Lake Superior shore trends N. E. for a distance of about 160 m. to the end of Keweenaw point, a long peninsula running out into the lake. On the E. side of this point is Keweenaw bay. Thence to Whitefish point the coast line presents a regular undulation with scarcely any good harbors. At Whitefish point it bends sharply S. and afterward E., enclosing with the Canada shore the deep basin known as Tequamenon bay, from the head of which flows St. Mary's strait. The Lake Huron shore, extending from the mouth of the St. Mary's westward to the strait of Mackinaw, is much broken and lined with islets; it is separated from Lake Michigan by the peninsula called Pointe St. Ignace. The shore of Lake Michigan is irregular, but offers no large inlets until Green bay is reached, which opens from the N. W. corner of the lake. More than half of the N. and W. shore of this bay belongs to Michigan, and just within its mouth are two inlets extending northward, called the Big and Little bays de Noquet. The general aspect of the northern peninsula is rugged and picturesque. The portion E. of the meridian of Marquette is an undulating plateau, sinking gradually

toward the south and more rapidly toward the north, the watershed being much nearer Lake Superior than Lakes Huron and Michigan. The highest points do not rise more than 400 ft. above Lake Superior. Numerous lakes and marshes are scattered over this plateau. The surface is covered with forests, except where fires have destroyed the timber and transformed the region into a desert. Soft woods, including pine, are the prevailing growth, but fine groves of sugar maple and beech also occur. W. of the plateau the country is irregularly mountainous, interspersed with swamps and lakes. A few of the peaks attain a height of 1,400 ft. above Lake Superior. The N. W. extremity of the peninsula is occupied by the Mineral or Copper range, which properly consists of three ranges: the main or central range, extending from Keweenaw point far into Wisconsin, flanked on the north by the Porcupine mountain range, and on the south by the South Copper range. The general trend of these ranges is N. 60° E. and S. 60° W. They do not attain so great a height as some of the peaks further E. The timber here, which is abundant and of excellent quality, is generally sugar maple; but little pine or other soft wood occurs. Immediately S. of the South Copper range is the Iron range. The northern peninsula contains most of the mineral wealth of the state, but the soil is generally sterile. The lower or southern peninsula, which is 277 m. in length from N. to S., and 259 m. in greatest width, is in nearly every respect a contrast to the northern. It lies between Lakes Huron and Michigan, and is bounded S. E. by the St. Clair river, Lake St. Clair, Detroit river, and Lake Erie. The Lake Huron shore is broken by Thunder bay toward the north and Saginaw bay near its centre. There are also several inlets on Lake Michigan, the chief of which are Great and Little Traverse bays. The surface is generally level, although in the south there is an irregular cluster of conical hills from 30 to 200 ft. high. A low watershed, culminating at an elevation of 600 or 700 ft., passes through the country from S. to N., much nearer the E. than the W. shore, with a very gradual and almost unbroken slope toward Lake Michigan, except near Au Sable river, where it partakes of a rugged character. The shores on both sides are in many places steep and elevated, and on Lake Michigan especially there are numerous bluffs and sand hills from 100 to 300 ft. high. The soil of the southern peninsula, except in the N. part, is luxuriantly fertile. The principal islands belonging to the state are Isle Royale and Grand island in Lake Superior; Sugar and Nebish islands in St. Mary's strait, and Drummond's island at its mouth; Marquette, Mackinaw, and Bois Blanc islands in the N. part of Lake Huron, near the mouth of the strait of Mackinaw; and the Beaver, Fox, and Manitou groups in the N. part of Lake Michigan.—The principal rivers are the Ontonagon and

Tequamenon, flowing into Lake Superior; the Cheboygan, Thunder Bay, Au Sable, and Saginaw, into Lake Huron; the Huron and Raisin, into Lake Erie; and the St. Joseph, Kalamazoo, Grand, Muskegon, Manistee, Grand Traverse, Manistique, and Escanaba, into Lake Michigan. Most of these are small, but the streams are so numerous that all parts of the state are abundantly watered. The Grand, Saginaw, St. Joseph, and some others are navigable for short distances. Many small ponds are also scattered over the surface.—The lower peninsula is composed wholly of groups of the Devonian and lower carboniferous series of rocks, except the central portion of the country, from which the streams flow on one side into Lake Huron, and on the other into Lake Michigan, which is occupied by the coal measures and permo-carboniferous series. Though this is the most elevated portion of the peninsula, the surface is little more than moderately rolling, the strata are horizontal, and the bituminous coal beds lie mostly too low to be worked without raising the water by pumping. The coal field, which embraces about 12,000 sq. m., is open to Lake Huron by Saginaw bay, the shores of which are mostly in this formation. It extends as far S. as Jackson, on the line of the Michigan Central railroad, where a bed 4 ft. thick is opened and worked 90 ft. below the surface. From the difficulty of obtaining the coal in large quantities, but little of it is shipped, and even the supplies for the Lake Superior iron works are carried chiefly from eastern Ohio. Around the coal field the underlying carboniferous limestone crops out in a narrow belt, and contains in some localities gypseous shales and some plaster of Paris. To this succeeds the wider outcrop of the slates and sandstones of the Portage and Chemung groups, which stretch along the shores of both Lake Michigan and Lake Huron. The limestones and other strata of the Helderberg and Niagara groups surround these, sweeping around into northern Ohio and Indiana and eastern Wisconsin, and forming the island of Mackinaw and the point of the peninsula S. of this island. The mineral productions found in these formations are of no great importance. The limestones give fertility to the soil, and are abundantly supplied for all the purposes they can serve. From the shores of Lake Huron, near Thunder bay, an excellent stone is quarried for grindstones; and near Saginaw bay and in the valley of Saginaw river salt water is obtained by boring. The statistics of the production of salt, which is extensive and still increasing, are given below. The northern peninsula exhibits four geological formations: the lower Silurian; the copper-bearing rocks; the iron-bearing rocks, corresponding, it is assumed, with the Huronian system of Canada; and the granitic rocks, believed to be the equivalents of the Laurentian of Canada. The Silurian underlies the E. plateau, and flanks the Copper range on the south,

forming also the valleys between the different members of that range. It is made up of various sandstones and limestones. The copper-bearing rocks are confined to the Mineral or Copper range, but occur outside of the peninsula on Isle Royale. This is the most productive copper district in the world, except Chili. Silver is frequently found in connection with the copper. The N. and W. portions of the central region of the peninsula, bordering on Lake Superior and the copper-bearing series, are occupied by the Huronian formation, which consists of a series of extensively folded beds of diorite, quartzite, chloritic schists, clay and mica slates, and graphitic shales, among which are intercalated the extensive beds of magnetic, specular, and other iron ores, for which this region is famous. The rest of the peninsula is occupied by the Laurentian series. The copper mines are in Ontonagon, Houghton (which contains the richest mines), and Keweenaw cos. The iron mines are in Marquette co. According to the census of 1870, there were 27 copper mines, with 86 steam engines of 5,943 horse power; hands employed, 4,188; capital invested, \$5,866,374; wages paid, \$2,346,535; value of product, \$4,312,167 (total product of the United States, \$5,201,312). The number of iron mines was 11, with 20 steam engines of 922 horse power; hands employed, 2,005; capital invested, \$3,810,000; wages paid, \$1,270,698; tons of ore obtained, 690,393; value, \$2,677,965. The yield of iron ore was greater than that of any other state except Pennsylvania. The yield of copper ore in 1873 was 18,636 tons (2,000 lbs. each), and the aggregate product of the mines from their opening in 1845 to the close of that year was 194,333 tons. The iron product of the state in 1873 was 1,250,000 tons (2,240 lbs.) of ore mined and 75,000 of pig iron manufactured. The total yield from the opening of the mines in 1856 to the close of 1873 was 6,784,129 tons of ore and 428,580 of pig iron. (See COPPER MINES, and IRON ORE.)—Michigan abounds with natural objects and antiquities interesting to the traveller. Among the former the most noteworthy are the "Pictured Rocks," on the shores of Lake Superior, about 30 m. W. of Sault Ste. Marie. These are sandstone bluffs of various colors, worn by the action of the waters into grotesque forms resembling castles, temples, arches, colonnades, &c., which from a steamer on the lake have the appearance of a gorgeous picture. These rocks extend along the shore for about 12 m., and rise from 200 to 300 ft. above the water. Sometimes cascades shoot over the precipice so that a vessel may sail between the descending waters and the natural wall of rock. In the northern peninsula and on Isle Royale there are the remains of very ancient mines and mining tools, and it is evident that a race well advanced in civilization occupied the country at some very distant period in the past, of which the Indians found in possession by the early explorers from Canada could

give no account. Foster and Whitney ("Executive Document No. 69," 31st congress, 1st session) give an interesting chapter on this subject.—The climate of Michigan is one of extremes, but much tempered by the proximity of the lakes. That of the southern peninsula is comparatively mild, while that of the northern, especially in the winter season, is cold and rigorous. The mean annual temperature at Detroit (lat. 42° 20', elevation 580 ft.) from 1836 to 1854 was 47° 25'; and at Fort Brady, near Sault Ste. Marie (lat. 46° 30', elevation 600 ft.) from 1823 to 1854, 40° 37". These results illustrate the isothermal conditions of the two peninsulas, the difference in annual heat being nearly 7° F. The mean distribution of the heat to the seasons in the same year was as follows:

PLACES.	Spring.	Summer.	Autumn.	Winter.
Detroit.....	45° 89°	67° 60°	48° 67°	26° 84°
Fort Brady.....	37° 60°	62° 01°	48° 54°	18° 31°

At Detroit the greatest difference in the monthly mean in any one year was 49° 97' (21° 95' to 71° 92'), and at Fort Brady 57° 81' (18° 19' to 71°). The average annual rainfall at the two places was 30·07 and 31·35 inches respectively, and in the seasons as follows:

PLACES.	Spring.	Summer.	Autumn.	Winter.
Detroit.....	8° 57	9° 29	7° 41	4° 86
Fort Brady.....	5° 44	9° 97	10° 76	5° 13

The mean annual temperature at Grand Haven (lat. 43° 5', elevation 616 ft.) for the year ending Sept. 30, 1873, was 44° 6'; mean temperature of the coldest month (January), 19° 2'; of the warmest (June and August), 69° 1'. The annual mean at Escanaba (lat. 45° 44', elevation 601 ft.) was 40° 01'; coldest month (December), 11° 3'; warmest (June), 69° 3'; total annual rainfall, 25·7 inches. At Marquette (lat. 46° 33', elevation 666 ft.) the annual mean was 38° 3'; coldest month (December), 12°; warmest (August), 63° 4'; total annual rainfall, 23·46 inches. The whole number of deaths in 1870 was 11,181, of which 4,822 were from general diseases, 1,349 from diseases of the nervous, 407 of the circulatory, 1,025 of the respiratory, and 1,800 of the digestive system. Among special diseases, there were 707 deaths from scarlet fever, 666 from enteric fever, 153 from intermittent fever, 97 from remittent fever, 1,844 from consumption, and 702 from pneumonia.—The northern peninsula with some exceptions is rugged and has a poor soil. It is, however, well timbered with white pine, spruce, hemlock, birch, oak, aspen, maple, ash, and elm. Much of the southern is occupied by oak openings and prairie, with a large portion of forest, in which walnut, sugar maple, oak, hickory, ash, basswood, elm, linden, locust, dogwood, beech, sycamore, cherry, pine, hemlock, spruce, tamarack, cypress, cedar, and chestnut are the

prevailing growths. White pine forms the chief wealth of the N. half of this peninsula. The upper portion of the state is beyond the N. line of Indian corn, but here the hardier grains mature. The southern produces Indian corn and the winter grains abundantly, and is the great agricultural district of the state. The soils in this portion are deep, chiefly a dark loam, often mixed with gravel and clay, and very fertile. Apples are grown here in great quantities. Peaches are successfully raised on the shores of Lake Michigan, while pears, plums, cherries, blackberries, raspberries, strawberries, and quinces flourish throughout the state. The vine is cultivated on the shores of Lakes Michigan and Erie, and in the principal river valleys. The lakes and streams afford productive fisheries, among which are those of the far-famed whitefish. According to the census of 1870, Michigan was 10th among the states in the value of agricultural productions, and 9th in the value of manufactures. The whole number of farms was 98,786, of which 6,897 contained less than 10 acres each, 13,170 from 10 to 20, 38,795 from 20 to 50, 27,687 from 50 to 100, 12,175 from 100 to 500, 57 from 500 to 1,000, and 5 more than 1,000 acres each. The number of acres of land in farms was 10,019,142, of which 5,096,939 were improved; cash value of farms, \$398,240,578; of farming implements and machinery, \$13,711,979; wages paid during the year, including the value of board, \$8,421,161; estimated value of farm productions, including betterments and additions to stock, \$81,508,623; value of orchard products, \$3,447,985; of produce of market gardens, \$352,658; of forest products, \$2,559,682; of home manufactures, \$338,008; of animals slaughtered or sold for slaughter, \$11,711,624; of live stock, \$49,809,869. The chief productions and live stock according to the census of 1870 and the state census of 1874 were:

1870.		1874.	
Wheat.....bushels	16,265,773	Wheat.....bushels	13,456,202
Rye....." "	144,508	Indian corn... "	20,792,905
Indian corn... "	14,056,238	Other grain... "	19,209,753
Oats....." "	8,954,466	Potatoes..... "	5,618,863
Barley....." "	584,558	Wool.....lbs.	7,728,011
Buckwheat.... "	436,755	Pork marketed "	43,434,106
Peas and beans "	349,365	Cheese..... "	4,101,912
Potatoes..... "	10,318,799	Butter..... "	27,972,117
Wool.....lbs.	8,726,145	Maple sugar.. "	4,319,793
Butter..... "	24,400,185	Fruit dried... "	2,664,709
Cheese..... "	670,804	Fruit and vege-	
Hops....." "	828,269	tables canned "	2,007,606
Flax....." "	240,110	Cider, barrels.. "	182,847
Maple sugar.. "	1,731,855	Wine, gallons.. "	50,851
Honey....." "	280,325	Hay, tons..... "	1,134,077
Milk sold, gallons	2,277,122	Apples.....bushels	5,928,275
Sorghum molasses..... "	94,636	Peaches..... "	22,069
Hay, tons..... "	1,290,923	Pears....." "	40,387
Horses on farms.. "	228,302	Plums....." "	3,667
Horses not on farms..... "	25,368	Cherries..... "	66,746
Milch cows..... "	250,859	Strawberries.. "	48,922
Working oxen..... "	36,499	Currents and	
Other cattle..... "	260,171	gooseberries.. "	40,562
Neat cattle not on farms..... "	87,605	Grapes, cwt..s. "	29,601
Sheep....." "	1,955,906	Horses..... "	281,304
Swine....." "	417,811	Working oxen.. "	38,901
		Milch cows..... "	321,732
		Other cattle..... "	307,554
		Sheep....." "	1,649,199
		Swine....." "	401,720

—The number of manufacturing establishments in 1850 was 2,083, producing goods to the value of \$11,169,002. In 1860 there were 3,448 establishments; hands employed, 23,190; capital invested, \$23,808,226; value of products, \$32,658,356. The whole number of establishments in 1870 was 9,455, having 2,215 steam engines of 70,956 horse power, and 1,500 water wheels of 34,895 horse power; number of hands employed, 63,694, of whom 58,347 were males above 16, 2,941 females above 15, and 2,406 youth; capital invested, \$71,712,283; wages paid, \$21,205,355; value of materials used, \$68,142,515; of products, \$118,394,676. The statistics of the principal branches (1870) are shown in the following table:

INDUSTRIES.	Number of establishments.	Hands employed.	Capital invested.	Value of products.
Agricultural implements..	164	969	\$1,254,759	\$1,569,596
Blacksmithing.....	904	1,997	729,598	1,391,337
Boots and shoes.....	765	2,494	1,167,181	2,552,931
Bread and bakery products	82	306	291,672	654,453
Brick.....	136	1,584	438,800	681,480
Carpentering and building	756	2,930	730,225	3,976,838
Carriages and wagons....	531	2,239	1,649,560	2,393,323
Cars, freight and passenger	3	823	615,223	1,488,742
Clothing.....	288	2,593	1,085,650	2,577,154
Cooperage.....	291	1,139	438,165	1,176,768
Copper, milled and smelted	19	636	1,591,000	9,260,976
Flouring and grist mill products	516	1,938	6,962,675	21,174,247
Furniture and chairs.....	245	2,394	2,067,420	1,953,888
Gas.....	13	111	1,549,029	522,329
Iron, forged and rolled..	3	465	725,000	730,750
“ bolts, nuts, nails, &c.	2	54	50,400	164,200
“ pigs.....	17	1,625	2,528,000	2,911,515
“ castings.....	196	1,101	1,571,447	2,082,532
Leather, tanned.....	99	478	897,047	1,606,311
“ curried.....	73	249	895,438	1,064,297
Liquors, distilled.....	1	15	75,000	105,000
“ malt.....	128	481	1,387,441	1,216,286
Lumber, planed.....	70	518	710,850	1,131,245
“ sawed.....	1,571	20,055	26,990,450	31,946,396
Machinery.....	105	1,311	1,628,979	2,390,564
Masonry, brick and stone.	159	666	57,833	655,905
Meat packed, beef.....	3	8	15,000	96,050
“ pork.....	4	33	170,000	533,750
Painting.....	103	453	143,400	493,732
Paper.....	11	261	376,000	499,392
Plaster ground.....	22	240	687,103	333,600
Printing and publishing..	65	726	697,777	1,071,523
Saddlery and harness....	288	824	460,436	851,388
Salt.....	65	858	1,717,500	1,176,811
Sash, doors, and blinds..	150	1,303	1,279,200	1,863,596
Ship building, repairing, and ship materials.....	26	637	547,000	709,384
Tin, copper, and sheet-iron ware	260	835	487,515	967,972
Tobacco and cigars.....	114	1,256	1,301,202	2,572,523
Wooden ware and wood work	71	596	596,975	711,175
Wool carding and cloth dressing	17	84	155,350	213,315
Woollen goods.....	38	555	858,200	996,208

The total value of saw-mill products was greater than that of any other state. In the quan-

tity of laths and lumber produced Michigan stood first; in the quantity of shingles, next to Wisconsin; and in the value of staves, &c., next to Indiana and New York. The number of steam engines employed in the saw mills was 1,137, of 41,216 horse power; water wheels, 547, of 12,448 horse power; number of saws, 7,052; amount of wages paid during the year, \$6,400,283; value of materials used, \$14,347,661. The products were 304,054,000 laths, 2,251,613,000 feet of lumber, 658,741,000 shingles, and staves, shooks, headings, &c., to the value of \$1,332,922. The whole number of bushels of grain ground was 16,891,910, and the products of the flouring mills intended for market (excluding flour, meal, &c., from grain ground for individual owners) were 10,956 cwt. of buckwheat flour, 3,759 barrels of rye flour, 963,101 of wheat flour, 3,375 bushels of barley meal, 610,103 of corn meal, and 1,508,180 cwt. of feed. There were 119,415 tons of iron ore smelted, producing 79,279 tons of pig iron. The quantity of salt manufactured was 3,981,316 bushels, more than was produced by any other state except New York and West Virginia. The quantity of lumber manufactured in 1873 amounted to 2,886,351,027 feet, viz.: E. Michigan, 1,351,878,286 feet; W. Michigan, 1,205,559,739; upper peninsula, 133,913,002; railroad and interior mills, 175,000,000. If the lumber cut into shingles were added, the aggregate would nearly reach 3,000,000,000 feet. The forests of the state are rapidly disappearing, but it is estimated that 33,000,000,000 feet of pine timber is still standing in the lower peninsula. The product of the salt wells for 1874 was 1,026,979 barrels. The total yield from the discovery of the wells in 1860 to the close of 1874 has been 7,789,419 barrels. The lake fisheries are of considerable importance. The value of the catch according to the census of 1870 was \$567,576; the chief items were 2,165 barrels of herring, 2,787 of pickerel, 47,436 of whitefish, and 14,268 of other fish.—Michigan is divided into four customs districts, viz.: Detroit, Huron (port of entry, Port Huron), Michigan (port of entry, Grand Haven), and Superior (port of entry, Marquette). The foreign commerce (except under the act of July 14, 1870, which permits the shipment of goods without appraisement to interior ports from the ports of first arrival) is carried on wholly with Canada, though an occasional vessel has been despatched from Detroit directly to Europe. The following table exhibits the statistics for the year ending June 30, 1874:

DISTRICTS.	Value of imports.	Exports of domestic products.	Exports of foreign products.	ENTRANCES.		CLEARANCES.	
				Vessels.	Tons.	Vessels.	Tons.
Detroit.....	\$1,450,072	\$3,240,839	\$52,601	3,854	870,937	3,879	880,495
Huron.....	852,569	5,695,294	430,750	612	485,423	644	490,640
Michigan.....	8,445	14,130	.....	16	3,994	10	2,808
Superior.....	47,400	179,980	.....	200	59,963	185	57,417
Total.....	\$2,353,786	\$9,043,243	\$458,381	4,682	1,420,317	4,718	1,431,355

The exports consist chiefly of grain, flour, hogs, lumber, beef and pork and their products, tobacco, cotton, and railroad cars. Of the exports through the district of Huron a large proportion is transported by land carriage. The number of entrances in 1873 was

4,335, with an aggregate tonnage of 1,357,462. The number of clearances in the same year was 4,275, tonnage 1,340,332. The vessels engaged in the coastwise trade for the year ending June 30, 1874, and the number built during the previous year, were as follows:

DISTRICTS.	ENTRANCES.		CLEARANCES.		REGISTERED, &C.		BUILT IN 1873.	
	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.
Detroit.....	5,190	858,127	4,412	885,070	365	83,099	89	14,738
Huron.....	8,448	1,027,335	8,359	1,066,338	314	53,265	30	12,841
Michigan.....	10,947	2,061,759	11,289	2,123,074	196	17,592	13	1,032
Superior.....	2,184	944,070	2,194	943,040	64	4,527	6	146
Total.....	21,769	4,886,321	21,484	5,017,522	939	158,483	93	28,802

The vessels belonging or registered in the state consisted of 368 sailing vessels of 52,907 tons, 358 steamers of 68,239 tons, and 213 unrigged vessels of 37,337 tons; those built included 42 sailing vessels of 15,383 tons, 34 steamers of 8,834 tons, and 17 unrigged vessels of 4,585 tons. The number of entrances in 1873 was

18,124 of 4,205,694 tons (4,783 of 2,056,040 tons steamers); clearances, 18,436 of 4,300,173 tons (4,855 of 2,070,157 tons steamers).—The number of miles of railroad in the state in 1844 was 206; in 1854, 444; in 1864, 898. The lines in operation in 1874, with their termini and their mileage within the state, were:

RAILROADS.	TERMINI.	Miles in operation in the state.
Chicago and Michigan Lake Shore.....	New Buffalo, on Michigan Central railroad, to Pentwater..	170
Branches.....	Holland to Grand Rapids.....	94½
	Muskegon to Big Rapids.....	55½
Chicago and Canada Southern.....	Grosse Ile to Chicago, Ill. (250 m.); completed to Fayette.	70
Chicago and Northwestern (Peninsula division)...	Menominee to Escanaba.....	64½
Branches.....	Escanaba to Lake Angeline mine.....	63
	To mines.....	36
Chicago, Detroit, and Canada Grand Trunk Junction	Port Huron to Detroit.....	59
Detroit and Bay City.....	Detroit to Bay City.....	108
Branch.....	Lapeer to Fish Lake.....	5
Detroit and Milwaukee.....	Detroit to Grand Haven.....	189
Detroit, Hillsdale, and Indiana.....	Ypsilanti to Bankers.....	65
Detroit, Lansing, and Lake Michigan.....	Detroit to Howard.....	164
Branches.....	Ionia to Stanton.....	23
	Kiddville to Belding.....	2
Detroit, Monroe, and Toledo*.....	Toledo, Ohio, to Detroit (65 m.).....	54½
Flint and Pere Marquette.....	Monroe to Ludington (235 m.); completed to Reed City..	207
Branches.....	East Saginaw to Bay City.....	12
	Flint to Otter Lake.....	19
	Saginaw to St. Clair Junction.....	5
Fort Wayne, Jackson, and Saginaw.....	Jackson to Fort Wayne, Ind. (100 m.).....	46
Grand Rapids and Indiana.....	Fort Wayne, Ind., to strait of Mackinaw (392 m.); completed to Petoskey (392 m.).....	272
Grand Rapids, Newaygo, and Lake Shore.....	Grand Rapids to Newaygo.....	36
Grand River Valley†.....	Jackson to Grand Rapids.....	84
Hecla and Torch Lake.....	Houghton county.....	4½
Jackson, Lansing, and Saginaw†.....	Jackson to strait of Mackinaw (295 m.); completed to Gaylord's.....	236
Kalamazoo and South Haven†.....	Kalamazoo to South Haven.....	39
Kalamazoo and White Pigeon*.....	Kalamazoo to White Pigeon.....	38
Kalamazoo, Allegan, and Grand Rapids*.....	Kalamazoo to Grand Rapids.....	58
Lake Shore and Michigan Southern.....	Buffalo, N. Y., to Chicago, Ill. (539 m.).....	116
Branches.....	Adrian to Jackson.....	46
	Adrian to Monroe.....	33½
Marquette, Houghton, and Ontonagon.....	Marquette to L'Anse.....	63
Branches.....	To mines.....	23½
Michigan Air Line.....	Jackson to South Bend, Ind. (114 m.).....	108½
Michigan Central.....	Detroit to Calumet, Ill. (270 m.).....	221
Michigan Lake Shore.....	Allegan to Muskegon.....	57
Mineral Range.....	Copper Harbor to Ontonagon river (100 m.); completed, Hancock to Calumet.....	12½
Northern Central Michigan*.....	Jonesville to Lansing.....	60
Paw Paw.....	Lawton, on Michigan Central railroad, to Paw Paw.....	4
Peninsula†.....	Lansing to Chicago, Ill. (205 m.).....	108½
Port Huron and Lake Michigan‡.....	Port Huron to Lansing (112½ m.); completed to Flint.....	66
Saginaw Valley and St. Louis.....	East Saginaw to St. Louis.....	35
St. Clair and Chicago Air Line.....	St. Clair to Jackson (120 m.); completed from Ridgeway, on Grand Trunk railroad, to Washington.....	22
Toledo, Canada Southern, and Detroit.....	Toledo, O., to Detroit (55 m.).....	50
Traverse City.....	Traverse City to Walton, on G'd Rapids and Indiana R. R.....	26
Total.....		3,267

* Operated by the Lake Shore and Michigan Southern railroad. † Operated by the Michigan Central railroad.
‡ Consolidated in 1873 under the title of the Chicago and Lake Huron railroad.

The only canals used for transportation are the St. Mary's ship canal and the Portage and Lake Superior ship canal. The former, about a mile long, around the falls of the St. Mary's at Sault Ste. Marie, was opened in 1855, and has been of great importance in facilitating commerce between Lakes Huron and Superior. The latter is about two miles long, and connects Portage lake with Lake Superior on the W. side of Keweenaw point. By opening a navigable channel through the base of the peninsula, it enables vessels to avoid the circuit around the point. It was completed in 1873. —In 1873 there were 77 national banks in the state, with a capital of \$9,802,200, and an outstanding circulation of \$7,139,217; 13 state banks, with a capital of \$1,184,897 80; and 10 savings banks, with a capital of \$631,300, and deposits amounting to \$4,000,000. There were 31 mutual fire insurance companies and 3 stock (1 fire and marine) of the state in operation, besides 88 companies of other states and 11 foreign companies authorized to do business in Michigan; also 37 life insurance companies, of which one, with a capital of \$100,000, was a Michigan company. —The executive power of the state is vested in a governor (salary \$1,000), lieutenant governor, secretary of state (\$800), superintendent of public instruction (\$1,000), state treasurer (\$1,000), auditor general (\$1,000), commissioner of the state land office (\$800), and attorney general (\$800), elected by the people for two years. The lieutenant governor is *ex officio* president of the senate, and upon the death, resignation, or disability of the governor exercises the functions of that office. The secretary, treasurer, and commissioner of the land office constitute a board of state auditors, to examine and adjust claims against the state, and also a board of state canvassers, to determine the result of elections for state officers. The secretary, treasurer, and auditor are a board of internal improvements, and the lieutenant governor, auditor, secretary, treasurer, and commissioner of the land office form the state board of equalization. A commissioner of insurance, railroad commissioner, commissioner of immigration, and salt inspector are appointed by the governor with the consent of the senate, the last for six and the others for two years. The state board of health consists of seven members, including the secretary, and the state board of agriculture of the governor and president of the agricultural college *ex officio*, with six other members. The legislative power is vested in a senate and house of representatives, elected every second year. There are 32 senate districts, each of which elects one senator. The representatives, not fewer than 64 nor more than 100 in number (at present 100), are apportioned among the counties and representative districts according to population. After each United States census, and also after each decennial state census (beginning in 1854), a reapportionment is made. Members of the

legislature and the lieutenant governor receive \$3 a day while in actual attendance, and 10 cents a mile in going to and from the seat of government. The regular sessions are held biennially in odd years. No one holding a United States, state, or county office, with minor exceptions, is eligible to a seat in the legislature. Appropriations for any religious sect or society, or theological or religious seminary, are prohibited; and no act can be passed authorizing the granting of licenses for the sale of ardent spirits or other intoxicating liquors. The constitution forbids the granting of the credit of the state to or in aid of any person, association, or corporation, and declares that the state shall not subscribe to nor be interested in the stock of any company, association, or corporation, nor engage in any work of internal improvement. The governor's veto can be set aside by a two-thirds vote of both houses. The judicial power is vested in a supreme court, circuit courts, probate courts, and justices of the peace, with such municipal courts as may be established by the legislature in cities. The supreme court consists of a chief justice and three associate justices (salary \$4,000), elected by the people for eight years (one retiring every two years), and has appellate jurisdiction. Four terms are held annually at Lansing. The state is divided into 20 judicial circuits, in each of which a circuit judge (salary \$1,500) is elected for six years. Circuit courts are held in each organized county, and have general original jurisdiction, civil and criminal, and appellate jurisdiction of judgments of inferior courts. A probate judge is elected in each county for four years, who holds a probate court with the usual powers. Four justices of the peace are elected in each township for a term of four years, with jurisdiction in civil cases involving not more than \$300, and such criminal jurisdiction as may be prescribed by law. The right of suffrage is conferred on all male citizens of the United States (including civilized Indians not members of any tribe) 21 years old and upward, who have resided in the state three months and in the township or ward where they offer to vote 10 days. General elections occur on the Tuesday after the first Monday of November in even years. Any inhabitant engaging in a duel is disqualified from voting and from holding office. Amendments to the constitution must be proposed by two thirds of each house of the legislature, and ratified by the people. Once in 16 years, beginning with 1866, the question of calling a convention to revise the constitution is to be submitted to the people. Treason is punishable with death; murder in the first degree with solitary confinement in the state prison at hard labor for life; other crimes with fines and various terms of imprisonment. A married woman may carry on business in her own name; her property is not liable for the debts of her husband, and she may deal with it and sue and be sued

respecting it as if unmarried. The principal grounds of divorce are adultery, impotence at the time of marriage, imprisonment for three years, desertion for two years, habitual drunkenness, and extreme cruelty. The rate of interest is 7 per cent., but as high as 10 per cent. may be stipulated for in writing. Michigan is entitled to two senators and nine representatives in congress, and therefore has eleven votes in the electoral college.—The valuation of property, according to the United States censuses, has been as follows:

YEARS.	ASSESSED VALUE.			True value of real and personal property.
	Real estate.	Personal estate.	Total.	
1850...				\$59,787,255
1860...	\$123,003,034	\$39,927,921	\$163,538,005	257,163,983
1870...	224,663,667	47,579,250	272,242,917	719,208,118

The total taxation not national in 1870 was \$5,412,957, of which \$396,352 was state tax, \$1,565,163 county, and \$3,451,442 town, city, &c. The total debt amounted to \$6,725,231, of which \$2,385,028 was state, \$1,275,479 county, and \$3,064,724 town, city, &c. The receipts into the state treasury during the year ending Sept. 30, 1873, were \$2,192,431 52; balance on hand at the beginning of the year, \$977,224 03; disbursements, \$2,314,942 11; balance in treasury at the close of the year, \$854,713 44. The items of receipt were as follows: from direct taxes, \$982,230 50; specific taxes, \$347,554 74, of which \$211,239 56 were from railroad companies, \$113,131 84 from insurance companies, \$18,778 37 from mining companies, \$2,236 43 from telegraph companies, \$2,016 54 from express companies, and \$152 from river improvement companies; sale of lands, \$230,760 42; interest on part paid lands, \$73,602 45; St. Mary's canal, \$29,271 85; 5 per cent. from United States on sale of public lands, \$28,723 20; miscellaneous sources, \$253,424 67; total cash receipts, \$1,945,567 83; receipts in land warrants, \$233,170 01; refundings and reimbursements, \$13,693 68. The disbursements were as follows: for principal of state debt, \$502,000; interest on state debt, \$117,748 43; interest on trust funds, \$196,318 62; interest on part paid lands, paid to educational institutions, \$55,490 39; state institutions, from appropriations, \$380,756 50 (university \$90,000, normal school \$15,384 07, agricultural college \$25,096, state public school \$36,513 43, reform school \$18,500, state prison \$27,800, insane asylums \$127,400, deaf and dumb and blind asylum \$40,063); new state offices and new capitol, \$129,143 76; on account of canal, \$14,207 80; miscellaneous, \$672,412 87 (including for printing and binding \$88,247 96, paper and stationery \$44,423 56, salaries \$148,557 89, pay and contingent expenses of legislature \$75,176 48); total disbursements in cash, \$2,068,078 42; disbursements in land warrants, \$233,170 01; refundings and reimbursements, \$13,693 68. The taxable value of prop-

erty in 1871, when the last assessment was made, was \$630,000,000. The taxation for state purposes for the year ending Sept. 30, 1874, was \$982,230 50, or 15-59 cents on \$100. The items are as follows: for agricultural college, \$37,398; insane asylums, \$169,000; general purposes, \$300,000; institution for deaf and dumb and blind, \$46,000; military fund, \$33,382 50; new state capitol, \$200,000; state prison building, \$50,000; state public school, \$43,000; state reform school, \$33,950; university, \$69,500. The total taxation, not including city taxes in the larger cities and special assessments (amounting probably to \$1,000,000), for the year ending Sept. 30, 1873, was \$11,660,055 84, viz.: state, \$829,976 05; county, \$2,660,513 35; township, \$1,963,113 22; highway, \$2,537,807 27; school, \$3,098,688 39; drain, \$241,864 60; miscellaneous, \$328,092 96. The total bonded debt of the state Sept. 30, 1873, was \$1,733,292 78, of which \$1,699,000 was interest-bearing, viz.: due Jan. 1, 1878, \$353,000; due July 1, 1878, \$111,000; canal bonds (guaranteed by state) due July 1, 1879, \$73,000; due Jan. 1, 1883, \$699,000; due May 1, 1890, \$463,000. The rate of interest on the last amount is 7 per cent.; on the rest, 6 per cent. The cash in the treasury applicable to the payment of this debt amounted to \$412,000 81. The trust debt was as follows: primary school funds, \$2,401,198 86; university fund, \$331,234 03; agricultural college fund, \$103,192 39; normal school fund, \$50,138 22; railroad and other deposits, \$4,227 46; total, \$2,889,990 96.—The charitable, penal, pauper, and reformatory institutions are under the general supervision of a board of four commissioners (besides the governor *ex officio*), who are appointed by the governor with the consent of the senate for eight years, one retiring every two years. The state institutions under their charge are the state prison at Jackson, the state reform school at Lansing, the state public school at Coldwater, the asylum for the insane at Kalamazoo, and the institution for the education of the deaf and dumb and the blind at Flint. The state prison was established in 1838. The grounds embrace about 30 acres, of which 10½ are enclosed within the prison walls. The number of cells is 648; they are built of stone, and each is 8 ft. 4 in. long, 3 ft. 4 in. wide, and 7 ft. high. The prisoners labor an average of about nine hours each week day in workshops in the enclosure; their services are let to contractors, and they are employed chiefly in the manufacture of furniture, wagons, agricultural implements, cigars, and boots and shoes. For the last few years the prison has been self-sustaining. The number of convicts in prison Sept. 30, 1872, was 589; received during the year, 287; discharged, died, &c., 221; remaining Sept. 30, 1873, 655. There is a library of about 2,000 volumes. The reform school for juvenile offenders was opened in 1856; it has a farm of 225 acres. The boys receive instruc-

tion in the elements of learning and are trained to habits of industry. Two family houses have recently been erected, affording accommodations for 75 boys of the smaller and better class, where they may be free from the example of the more vicious. The number of inmates Sept. 30, 1872, was 218; received during the year, 101; released, 97; remaining Sept. 30, 1873, 222. The state public school for neglected and dependent children was established by the act of April 17, 1871, and was opened May 22, 1874. The grounds embrace 27 acres, and the buildings comprise a large central structure for school and industrial purposes and several cottages in which the pupils may be separately classified, having accommodations for 165 inmates; the number in the institution on Aug. 15, 1874, was 185. The children are kept in school $4\frac{1}{2}$ hours a day, and those that are old enough work three hours a day. It is estimated that there are about 300 children in the state between the ages of 4 and 16 years who come within the design of this institution. The asylum for the insane was opened in 1859. The grounds embrace 195 acres, part of which is occupied as a farm and garden. With the new building to be completed in 1875 the institution will have accommodations for 300 patients in the female and 260 in the male department. The expenses are defrayed chiefly by receipts from inmates and from counties for the support of poor patients, with appropriations by the legislature to meet deficiencies. The number of patients Dec. 1, 1870, was 305 (156 males and 149 females); received during the succeeding two years, 155 (99 males and 56 females); discharged, 155 (recovered 56, improved 32, unimproved 40, died 27); remaining Sept. 30, 1872, 305 (157 males and 148 females). The number in the institution on Aug. 14, 1874, was 465, of whom 232 were males and 233 females. The legislature in 1874 appropriated \$400,000 for the erection of another insane asylum, and Pontiac has been selected as the site. The institution for the education of the deaf and dumb and the blind was organized in 1854. Workshops have recently been connected with it, in which the pupils are taught mechanical occupations. The mental training is similar to that given in other institutions of the kind. The farm and grounds contain 94 acres. The number of pupils in attendance during the two years 1871 and 1872 was 219, of whom 171 (93 boys and 78 girls) were deaf mutes and 48 (25 boys and 23 girls) blind. The number remaining Sept. 30, 1872, was 164, of whom 137 were deaf mutes and 27 blind. The Detroit house of correction is a city institution, but it receives all females sentenced to the state prison and criminals convicted of misdemeanors from all parts of the state, for whose board payment is made by the state or counties. The prisoners are principally employed in the manufacture of chairs and cigars, under the direction of the superintendent, and the earnings exceed

the expenses. Provision is made for the education of the inmates, and in the house of shelter connected with the institution a limited number of the girls are surrounded with the influences of a home. The number of prisoners Jan. 1, 1873, was 443; received during the year, 2,409; discharged, 2,321; remaining Dec. 31, 1873, 531, of whom 416 were males and 115 females. Of those received during the year, 1,804 were from the city of Detroit, 595 from other parts of the state, and 10 from other states (United States prisoners). The commissioners also have the general oversight of the county jails and poorhouses. The number of jails is about 50. They vary from cheap log structures to expensive and imposing edifices, some costing less than \$100 and others \$50,000 or \$60,000. The estimated value of jail property is \$400,000. The average number of inmates is about 300; annual cost of maintaining jails, \$50,000. There are 51 poorhouses, each having a farm connected with it; but few of the buildings have been constructed especially for the purpose. The whole number of paupers received in the county poorhouses and Washtenaw and Wayne county asylums for the insane, during the year ending Sept. 30, 1873, was 3,798; average number maintained, 1,482; number under 16 years of age, 577; number of persons temporarily relieved outside the poorhouses, 13,785; whole amount expended from the poor fund, \$403,096 18, of which \$147,722 53 was for the maintenance of poorhouses, and \$158,039 25 for temporary relief outside; estimated value of farms and appurtenances, \$698,554 57; of paupers' labor, \$7,628 50; of products of the farms, \$60,519 15. The whole number of insane persons received was 412, average number maintained 284; whole number of idiots 196, average number 178; whole number of blind 47, average number 39; whole number of mutes 12, average number 11. Of those received during the year, 1,551 were native-born whites, 139 colored, 16 Indians, 36 of unknown birth, and the rest foreigners.—Michigan has an excellent system of nearly 6,000 free public schools. Districts having fewer than 30 children between 5 and 20 years of age are required, under a heavy penalty, to have three months' free school annually; districts with 30 to 800 children, five months; and districts with over 800, nine months. The actual average length is a little over seven months. The state superintendent of public instruction has the general oversight and supervision of these and all other educational institutions of the state, including in some respects all the local and denominational colleges. A county superintendent of common schools is elected in each county for two years, whose duty it is among other things to examine candidates for the position of teacher and grant certificates for his county. The state superintendent of public instruction may grant certificates effectual throughout the state.

A board of township school inspectors is elected annually, the township clerk being *ex officio* clerk of the board, with power to divide the township into districts. Each school district has a board elected by its voters, consisting of a moderator, a director, and an assessor, one being elected annually for three years. Any district having more than 100 children of school age may by a two-thirds vote decide to have a board of six trustees, two being elected annually for three years. These boards, when directed by a vote of the people, have power to establish graded schools and high schools. For graded schools two or more contiguous districts having together more than 200 scholars may unite. The income of the primary school fund is apportioned by the superintendent of public instruction to the townships and cities in proportion to the number of youth in each between the ages of 5 and 20 years. The act of April 15, 1871, requires all children between 8 and 14 years of age to be sent to the public schools at least 12 weeks in a year (six weeks at least of which shall be consecutive), unless taught at home or in a private school. According to the report of the superintendent of public instruction for 1873, the number of school districts was 5,521; children between 5 and 20 years of age, 421,322; between 8 and 14, 181,604; whole number attending school during the year, 324,615; number in attendance under 5 or over 20 years of age, 5,854; average attendance, 162,300; average length of schools, 7 months; number of school houses, 5,572 (80 stone, 641 brick, 4,246 frame, 605 log); seats, 399,067; value of school houses and lots, \$8,105,391; number of teachers employed, 11,950 (3,010 males and 8,940 females); number of township libraries, 207, with 49,291 volumes; of district libraries, 1,099, with 115,331 volumes. Of the schools 311 were graded, with a total attendance of 118,616. The amount on hand at the beginning of the year was \$530,580 27; receipts, \$3,212,772 43, viz.: township tax, \$465,912 84; primary school fund, \$194,479 58; tuition of non-resident pupils, \$31,199 81; district taxes, \$2,095,220 17; other sources, \$412,253 87. The expenditures were \$3,148,885 52, viz.: wages of male teachers, \$681,565 24; of female teachers, \$1,071,309 43; construction and repairs, \$597,006 68; other purposes, \$788,902 96; balance on hand at

the close of the year, \$594,467 18; total debt of school districts, \$1,707,700 16. The state normal school at Ypsilanti was established by the act of March 28, 1849, and went into full operation in the spring of 1853. This is managed by a state board of education, consisting of the superintendent of public instruction, who is *ex officio* secretary, and three members elected by the people for six years, one retiring biennially. There are three courses of study: one of two years, designed to prepare students to teach in the common schools; another of three years, embracing higher English studies; and the third of four years, including ancient or modern languages. A model school is connected with the institution. Applicants for admission, if females, must be not less than 16, or if males not less than 18 years of age, and are required to sign a declaration of intention to devote themselves to the business of teaching in the schools of the state. Two students from each representative district are exempt from the payment of tuition; others are required to pay \$10 a year. The diploma of the school entitles the possessor to teach in the public schools without examination. The number of instructors in 1873-'4 was 14; of students in the normal department, 364; of pupils in the model school, 122; of volumes in the library, 2,000. According to the United States census of 1870, the number of schools was 5,595, with 2,999 male and 6,560 female teachers, 128,949 male and 137,678 female pupils, and an income of \$2,550,018 (\$81,775 from endowment, \$2,097,122 from taxation and public funds, and \$371,121 from other sources, including tuition). Of the whole number of schools, 5,414 (3 normal, 37 high, 62 grammar, 570 graded common, and 4,742 ungraded common) were public, and 181 not public, having 582 teachers, 11,799 pupils, and an income of \$385,529, of which \$81,775 was from endowment, \$77,500 from taxation and public funds, and \$226,254 from other sources, including tuition. The schools not public were divided as follows: classical, 12 (9 colleges and 3 academies); professional, 3 (1 law, 1 medical, 1 theological); technical, 18 (1 agricultural, 6 commercial, 1 for the blind and the deaf and dumb, 10 of music); day and boarding, 119; parochial and charity, 29.—The statistics of the colleges of Michigan for the year 1873-'4 are contained in the following table:

INSTITUTIONS.	Location.	Date of organization.	Denomination.	No. of instructors.	Students.	Volumes in libraries.
University of Michigan.....	Ann Arbor.....	1841	None.....	44	1,105	30,000
*Hillsdale college.....	Hillsdale.....	†1855	Freewill Baptist.....	7	606	4,500
*Kalamazoo college.....	Kalamazoo.....	†1855	Baptist.....	9	192	2,250
*State agricultural college.....	Lansing.....	1857	None.....	7	143	2,500
Adrian college.....	Adrian.....	1859	Methodist.....	10	174	400
Olivet college.....	Olivet.....	†1859	Congregational and Pres..	14	293	5,000
Albion college.....	Albion.....	†1860	Methodist Episcopal.....	8	201	2,000
Hope college.....	Holland.....	1866	Reformed.....	10	188	1,200
Young ladies' seminary and college institute.....	Monroe.....	1851	None.....	8	109	1,200
Michigan female seminary.....	Kalamazoo.....	1856	Presbyterian.....	10	57	500

* 1872-'3.

† Date of reorganization under general law.

The state agricultural college was established by the act of Feb. 12, 1855, and was opened for the reception of students in May, 1857. Subsequently the land (240,000 acres) received by the state for the endowment of a college of agriculture and the mechanic arts, under the act of congress of July 2, 1862, was bestowed upon this institution; 64,598 acres have been sold, producing a fund of \$207,500 74, the interest of which is applied to the support of the college. An annual appropriation is also made by the legislature. Tuition is free to students from the state; those from other states pay \$20 a year. The institution has a farm of 676 acres (300 under cultivation), valuable collections of plants, animals, and minerals, a chemical laboratory and apparatus, philosophical and mathematical apparatus, and a museum of mechanical inventions. The branches of study comprise logic and philosophy, elementary, analytical, and agricultural chemistry, chemical physics, meteorology, practical agriculture, botany, horticulture, landscape gardening, physiology, zoology, entomology, geology, mathematics, physics, civil engineering, and English language and literature, with French in the senior year. The regular course is four years, upon the completion of which the degree of bachelor of science is conferred. Candidates for admission are required to be at least 15 years old, and to pass an examination in the common English branches. The students labor three hours a day on the farm or in the garden, for which they receive remuneration. Besides those mentioned in the table, the faculty of instruction in 1872-'3 embraced seven others, including farmers, gardeners, steward, &c. The students were divided as follows: resident graduates, 3; seniors, 17; juniors, 22; sophomores, 24; freshmen, 52; in special courses, 14; in chemical manipulation, 8; ladies, 3. For an account of the state university, see MICHIGAN, UNIVERSITY OF. The other institutions in the table, except the last two, admit both sexes, and have a preparatory department, besides a collegiate department embracing usually a classical and a scientific course. Adrian and Olivet colleges have normal courses, and Adrian, Hillsdale, and Hope colleges theological departments. The Detroit medical college, founded in 1868, in 1873-'4 had 17 professors and 72 students. The Detroit homœopathic college was organized in 1871, and admits both sexes. In 1874 it had 8 professors.—The census of 1870 returns 26,763 libraries, containing 2,174,744 volumes, of which 23,761, with 1,596,113 volumes, were private. Of those not private, there were 1 state, with 31,265 volumes; 423 town, city, &c., 124,207; 49 court and law, 10,359; 246 school, college, &c., 37,734; 1,731 Sabbath school, 239,471; 436 church, 81,891; and 116 circulating libraries, 53,704. The number of newspapers and periodicals was 211, issuing 19,686,978 copies annually, and having a circulation of 253,774, viz.: 16 dai-

ly, circulation 27,485; 3 tri-weekly, 5,000; 174 weekly, 192,889; 2 semi-monthly, 1,300; 16 monthly, 27,100. They were classified as follows: advertising, 2; agricultural and horticultural, 1; benevolent and secret societies, 2; commercial and financial, 3; illustrated, literary, and miscellaneous, 17; political, 167; religious, 7; technical and professional, 12. Five are printed in Dutch and 8 or 10 in German. The statistics of churches for 1870 are contained in the following table:

DENOMINATIONS.	Number of regular-tithes.	Ecclesiastics.	Sittings.	Value of property.
Baptist, regular.....	385	218	70,140	\$1,029,680
" other.....	31	14	8,960	26,800
Christian.....	38	18	4,625	51,550
Congregational.....	156	114	38,820	742,200
Episcopal.....	100	79	26,750	911,250
Evangelical Association.....	15	11	2,350	24,000
Friends.....	10	8	2,000	8,550
Jewish.....	5	3	1,300	51,000
Lutheran.....	96	51	28,150	860,650
Methodist.....	364	469	140,290	2,356,800
Moravian.....	1	1	100	800
New Jerusalem.....	3	3	970	12,000
Presbyterian, regular.....	177	132	45,925	1,069,900
" other.....	10	10	8,000	54,500
Reformed (late Dutch Reformed).....	26	24	8,700	120,150
Reformed (late German Reformed).....	19	10	2,800	24,750
Roman Catholic.....	167	148	62,991	2,087,280
Second Advent.....	39	21	4,840	44,500
Spiritualist.....	35	5	1,190	15,050
Unitarian.....	7	4	1,700	42,500
United Brethren in Christ.....	69	19	4,225	40,800
Universalist.....	23	20	5,550	92,200
Union.....	3	3	750	6,000
Total.....	2,239	1,415	456,226	\$9,183,816

—The name Michigan appears to be derived from the Chippewa words *mitchi*, great, and *sawgyegan*, lake, and was formerly applied to both Huron and Michigan, but is now restricted to the latter lake. The discovery and early settlement of the state are due to the French missionaries and fur traders. The site of Detroit was visited as early as 1610, and in 1641 some French Jesuits reached the falls of the St. Mary. The first European settlement within the limits of the state was the mission at Sault Ste. Marie, which was founded by Father Marquette and others in 1668. Fort Michilimackinac (now Mackinaw) was established three years later. In 1701 an expedition under Antoine de la Mothe Cadillac founded Detroit. From this period until the erection of the country into a territory of the United States, Michigan made slow progress. It came under the dominion of Great Britain with other French possessions in 1763. On the expulsion of the French the conspiracy headed by the Indian chief Pontiac, and designed for the extermination of the whites, broke out and involved the settlements in bloodshed. The garrison of Michilimackinac was butchered, and Detroit underwent a long siege. On the treaty of peace which closed the revolutionary war, Michigan was not at once surrendered,

and the Americans did not take possession of Detroit till 1796. At first it was included in the government of the territory northwest of the Ohio, and hence has always been amenable to the ordinance of 1787. Subsequently it formed part of the territory of Indiana. In 1805 the territory of Michigan was constituted, Gen. William Hull being its first governor. During the war of 1812-'15 it was exposed to great suffering. Detroit was taken by the British in August, 1812, under circumstances which led to Gen. Hull, the American commander, being sentenced to death by a court martial; the sentence was remitted, and facts afterward divulged materially relieved him from blame. Michilimackinac was also captured, and at Frenchtown in January, 1813, a number of American prisoners were massacred by the Indians. The British were soon afterward driven out of the territory by Gen. Harrison; and in October, 1814, a truce was concluded with the Indians. The first land surveys entered upon were commenced in 1816, and in 1818 the lands were brought into market for public sale. From this period the prosperity of Michigan properly dates. In 1819 the territory was authorized by act of congress to send a delegate to that body, and the right of suffrage in this case extended to all taxable citizens. In 1819, 1821, and 1836 the Indians made important territorial cessions, and by this time all the lower peninsula and a part of the upper were freed from Indian title. In 1836 Wisconsin territory was formed from the W. portion of Michigan. This region had been annexed to the original territory of Michigan partly in 1818 and partly in 1834. Up to 1823 the legislative power was intrusted to the governor and judges; but in that year congress passed an act transferring it to a council, consisting of 9 persons selected by the president from 18 chosen by the citizens, and the judicial term was limited to four years. In 1825 the council was increased to 13 members selected as before, but two years later the law was so altered that the electors could choose their councillors without the further intervention of the president or congress. In May, 1835, a convention at Detroit formed a constitution by which Michigan claimed a strip of territory also claimed by Ohio. For a time a conflict seemed inevitable, but in June, 1836, congress passed an act admitting Michigan into the Union on condition that she relinquished her claim to the disputed territory, in place of which the region known as "the upper peninsula" was given to her. These conditions were rejected by one convention, but accepted by another in December, 1836; and in January, 1837, Michigan was admitted into the Union. By a legislative act of March 16, 1847, the seat of government was removed from Detroit to Lansing. In 1850 a new constitution was adopted, which with subsequent amendments continues in force. The number of men furnished by Michigan to the Union armies during the civil war was 90,747. The number of those

that fell in battle or died of wounds or of disease in the service was 14,823, of whom 357 were commissioned officers. The payments by the state for bounties, premiums for recruits, and other war purposes amounted to \$2,784,408; by counties, cities, and townships for the same purposes, \$10,173,336 79; by counties for relief of soldiers' families, \$3,591,248 12; total, \$16,548,992 91.—See "Michigan Geological Survey," by Douglass Houghton (1st-4th annual reports, Detroit, 1838-'41); and "Geological Survey of Michigan: Upper Peninsula, 1869-'73," by T. B. Brooks, Raphael Pumpelly, and Dr. C. Rominger (2 vols., with an atlas, New York, 1873).

MICHIGAN, Lake, one of the five great lakes of the United States, and the only one which is entirely included in these states. It lies in a N. and S. direction, extending from the N. W. corner of Indiana and the N. part of Illinois about 320 m. to Mackinaw, where it communicates with Lake Huron by a strait 4 m. wide in its narrowest part. The lake is bounded E. by the lower peninsula of Michigan. The upper peninsula bounds it N. W. In this portion is Green bay, which extends S. into Wisconsin; this state and Illinois complete the western boundary of the lake. The following are its dimensions as given by Dr. Douglass Houghton: length, 320 m.; mean breadth, 70 m.; mean depth, 1,000 ft.; elevation above the sea level, 578 ft.; area, 22,400 sq. m., exceeding the area of Lake Huron by nearly 2,000 sq. m. The country around Lake Michigan is for the most part low and sandy; on the E. side particularly the sands thrown up by the waves are blown inland and form hills, which sometimes are 150 ft. high. The rocks are the limestones and sandstones of the sub-carboniferous groups, lying in horizontal strata, and never rising into bold cliffs. On the Michigan side they belong chiefly to the Portage and Chemung groups, and on the Illinois side to the Helderberg limestone. Along the southern shores are post-tertiary beds of clay and sand lying a few feet above the level of the lake, and containing fresh-water shells like those living in its waters. This fact and the low watershed that separates the lake from the valley of the Illinois river, together with the great capacity of this valley, which appears as if worn by a mighty river, render it probable that the waters of Lake Michigan at some period found their way by the valley of the Mississippi into the gulf of Mexico. The lake at present is believed to be moving westward, gradually encroaching on the shores of Wisconsin and leaving those of Michigan. The existence of a lunar tidal wave was determined by the observations of Lieut. Col. James D. Graham at Chicago in 1858. The mean of 340 observations shows a difference of elevation of the lake surface between high and low water of 153 thousandths of a foot; and the mean of 24 semi-diurnal spring tides (*i. e.*, one day before and two days after new or full moon) gives a difference of elevation of

245 thousandths of a foot, or a little over 3 inches. High water occurs half an hour after the meridian passage or southing of the moon. —This lake has few harbors and bays, and the only islands it contains are at its N. E. extremity. It is not therefore very safe to navigate, especially as it is subject to severe storms at different seasons. But there is a large traffic on it, between Chicago and the lower lake ports. The straits of Mackinaw, which longest retain the ice, are usually open between May 1 and Dec. 1. The fish of the lake are like those found in Lake Huron, and the fisheries are for the most part concentrated about Mackinaw. The best harbors are at Little Traverse bay, and at Grand Haven at the mouth of Grand river on the E. shore of the lake. Chicago, near the head of the lake, has but an indifferent harbor, and the same may be said of those of Milwaukee and Sheboygan on the W. side.

MICHIGAN, University of, an institution of learning at Ann Arbor, which owes its foundation to a grant of lands by congress in 1826 to the territory of Michigan, including two townships containing 72 entire sections, which on the admission of the state were conveyed to it for the support of the university. The present institution was established by a legislative act of March 18, 1837. It was first opened for students on Sept. 20, 1842. The university consists of three departments: the department of literature, science, and the arts; the department of medicine and surgery, organized in 1850; and the department of law, 1859. Each has its own faculty of instruction, while the university senate is composed of all the faculties. The department of literature, science, and the arts embraces six regular courses of four years each, and two shorter special courses. The regular courses, with the degrees that are conferred upon their completion, are as follows: classical (bachelor of arts), scientific (bachelor of science), Latin and scientific (bachelor of philosophy), Greek and scientific (bachelor of philosophy), civil engineering (civil engineer), mining engineering (mining engineer). The special courses are one in analytical chemistry and one in pharmacy. On the completion of a two years' course in pharmacy the degree of pharmaceutical chemist is conferred. Students may also pursue selected studies for any period not less than one term. Post-graduate courses are provided for graduates of the university

or of any other collegiate institution who may desire to pursue advanced studies, whether for a second degree or not. The regular course in the medical department is two years. Students have the advantages of clinical instruction in a well arranged hospital on the university grounds, under the charge of the faculty. In the law department the degree of bachelor of law is conferred upon candidates 21 years old and upward, who have completed the course of two years and have passed a satisfactory examination. A year's course in another law school, or one term's practice of law under a license from the highest court of general jurisdiction in any state, is accepted as an equivalent for the first year in this institution. The degree entitles the holder to an immediate license to practise in all the courts of Michigan. Candidates for admission to the academic department must be at least 16 years of age, and to the law department 18. Both



University Hall, Michigan University.

sexes are admitted to all departments, but the courses of lectures for women in the medical department are distinct from those for men. Students before entering any department are required to pay a matriculation fee of \$10 if residents of Michigan, and of \$25 if resident elsewhere. There is also an annual payment of \$15 for residents of Michigan, and of \$20 for students from other states or countries. The members of faculties and other officers of the university in 1873-'4 numbered 44, viz.: president, 1; professors, 23; librarian, 1; assistant professors, 6; lecturers, 2; instructors, 8; assistants, 3. The faculty of the department of literature, science, and the arts embraced 14 professors, 6 assistant professors, and 9 other instructors; medical faculty, 8 professors, 2 lecturers, and 1 other instructor; law faculty, 4 professors. The number of students in the department of literature, science, and the arts was 484, of whom 52 were females, viz.: resident graduates, 9; seniors, 70; juniors, 96; sophomores, 90; freshmen, 118;

in selected studies, 33; in pharmacy, 68. Of those in the regular courses, 175 were pursuing the classical, 76 the Latin and scientific, 90 the scientific, and 33 the engineering course. The number of students in the medical department was 314, of whom 34 were females; in the law department, 314 (124 seniors and 190 juniors), of whom 5 were females; whole number in the university, deducting repetitions, 1,105. The number of degrees conferred at commencement in 1873 was 329, viz.: pharmaceutical chemist, 9; civil engineer, 11; bachelor of science, 12; bachelor of philosophy, 15; bachelor of arts, 40; doctor of medicine, 91; bachelor of law, 123; master of science in course, 8; master of arts in course, 19; master of arts on examination, 1. According to the last triennial catalogue, published in 1871, the whole number of alumni was 2,900, of whom 2,798 were living. The libraries accessible to the students contain about 30,000 volumes. These are the university library, 22,000; medical library, 1,500; law library, 3,000; and the libraries of two literary societies in the department of literature, science, and the arts, and of the Christian association connected with the university. The university museum contains valuable and constantly increasing collections, illustrative of natural science, ethnology, art, history, agriculture, anatomy, and materia medica. The geological cabinet contains about 14,000 distinct entries and 41,000 specimens, including a large and complete series of lithological and palæontological specimens obtained through the state geological surveys; the zoological cabinet, 11,500 entries and more than 45,000 specimens, including a complete series of the birds that visit Michigan, with most of the mammals of the state, a nearly complete series of the reptiles found E. of the Rocky mountains, 2,000 species of mollusca, and a considerable collection of fishes and radiata; the botanical cabinet, 9,000 entries, 5,000 species, and 45,000 specimens, including a collection of Alaskan plants, and 1,500 entries, 1,175 species, and 9,000 specimens of the plants of Michigan. The mineralogical cabinet embraces a valuable collection of the minerals of the state, and a collection of more than 6,000 specimens, chiefly European, purchased of the late Baron Lederer. The collections in the department of fine arts and history embrace a gallery of casts of the most valuable ancient statues and busts, a gallery of engravings and photographic views executed in Italy and Greece, a collection of historical medallions, &c. In the department of archaeology and relics the collections embrace among other specimens various articles of domestic and warlike use among the American Indians and the islanders of the South Pacific. The astronomical observatory, erected by citizens of Detroit, was opened in 1854. The building consists of a main part, with a movable dome and two wings. It contains a fine large meridian circle, a sidereal clock, two collimators; a chrono-

graph, with Bond's new isodynamic escapement, for recording observations by the electro-magnetic method; and a refracting telescope, with an object glass 13 inches in diameter. The university grounds embrace 44½ acres. Besides the observatory, there are a central building, called University hall, for the department of literature, science, and the arts; buildings for the departments of law and medicine; a chemical laboratory, and residences for the president and professors. The entire cost of the buildings was about \$280,000. University hall has a front of 347 ft., with a depth in the centre of 140 ft. and on the wings of 40 ft.; height from the basement to the summit of the dome, 140 ft. In the front of the second story there is a well arranged auditorium, with sittings for 3,000 persons. The receipts into the treasury for the year ending June 30, 1873, including \$20,225 46 on hand at the beginning of the period, amounted to \$124,468 52, of which \$38,667 was received from the state on account of the university interest fund, \$28,000 from special state appropriations, \$23,005 from students' fees, and the rest from miscellaneous sources. The expenditures were \$107,416 81, of which \$73,392 16 was for salaries and janitors' wages, \$2,250 for libraries, the rest for various purposes; balance, \$17,051 71. The university fund, being the proceeds of the sale of the university lands, amounts to \$543,010 24. It is held in trust by the state, which pays interest thereon at the rate of 7 per cent. per annum. The university is under the control of a board of eight regents, who are elected by the qualified voters of the state for a period of eight years, two retiring every two years. They choose the president of the university, who is *ex officio* a member and president of the board. Previous to 1852, under the regulations then in force, there was no president of the university. Since that time the office has been filled as follows: Henry P. Tappan, D. D., 1852-'63; Erastus O. Haven, D. D., 1863-'9; Henry S. Frieze, LL. D. (acting), 1869-'71; James B. Angell, LL. D., appointed in 1871 and still in office.

MICHIGAN CITY, a town of Laporte co., Indiana, on the S. shore of Lake Michigan, at the mouth of Trail creek, 140 m. N. by W. of Indianapolis, and 40 m. E. S. E. of Chicago; pop. in 1860, 3,320; in 1870, 3,985. It is the principal lake port of the state, and is at the intersection of the Michigan Central, the Louisville, New Albany, and Chicago, and the Indianapolis, Peru, and Chicago railroads. Its trade is considerable. The Michigan Central railroad has here extensive repair and locomotive shops. The town is the seat of the northern state prison, and contains a national bank, a high school, and ten other public schools, a weekly newspaper, and seven churches.

MICHILMACKINAC. See MACKINAW.

MICHIOACAN, or *Mechoacan*, a maritime state of Mexico, bounded N. by Jalisco, Guanajuato, and Querétaro, E. by Mexico, S. by Guerrero,

S. W. by the Pacific, and W. by Colima and Jalisco; area, 21,609 sq. m.; pop. in 1868, 618,240. The face of the country is extremely mountainous, being traversed in every direction by the Sierra Madre and its branches; there are several peaks of considerable elevation, especially in the S. portion, where, among other volcanoes, is that of Jorullo. (See JORULLO.) The culminating point is the Cerro de Santa Rosa, in the district of Tlapujahua, about 17,000 ft. Between the ridges stretch elevated and fertile valleys, watered by several rivers, the principal of which are the Lerma and Mescalapa Balsas, and a great number of mountain torrents. Of the 11 lakes, those most noteworthy are Chapala, about 60 m. long by 20 m. in width, and the Pátzcuaro, 30 m. in circumference. Along the coast line, 100 m. in extent, the only ports are those of San Telmo, Bucería, and Maratua; the first was formerly open to foreign and coasting trade, but did not prosper owing to the want of suitable shelter for shipping. Michoacan has a great variety of climates, from extreme cold to excessive heat; but it is in general very healthy. The mean annual temperature at Morelia is 71° F. The mineral productions are silver with an admixture of gold, copper, cinnabar, iron, coal, lead, emery, sulphur, copperas, lithographic stone, marble, &c. The mines, now comparatively few, yield annually \$1,175,300, of which silver is about one third. The soil, wherever accessible, is extremely fertile; maize in most parts yields 400 fold. Cattle, horses, mules, asses, and hogs are extensively reared; and the lakes and rivers abound in excellent fish, the taking of which forms an important industry. Among the manufactures are rebazos, sarapes (Mexican shawls), blankets, and silver ware of various kinds; and there are numerous flour mills, a glass factory, and in Morelia a steam weaving factory. The exports embrace gold, silver, copper, cabinet and dye woods, coffee, indigo, and silk, mostly sent to the states of Mexico, San Luis Potosí, and Durango, and to Guatemala. There are good roads in the state; and in 1872 Morelia was placed in communication with the principal telegraph lines of the republic. The value of real estate in 1869 was estimated at \$18,498,951 10; and the government expenditure in the same year was \$382,917 66. Michoacan has a state college, 53 schools for males and 28 for females, with an attendance of 11,426. There are several benevolent institutions. The state is divided into 17 districts. The capital is Morelia (formerly Valladolid); and the chief commercial towns are Morelia, Puruándiro, Zamora, Ario, Zacámbaro, and Tarétan.

MICIPSA. See JGUERTHA.

MICKIEWICZ, Adam, a Polish poet, born in Novogrodek, Lithuania, in 1798, died in Constantinople, Nov. 27, 1855. He studied physics and chemistry at the university of Wilna, but finally devoted himself almost exclusively to literature and poetry, and became professor

of literature at Kovno. In 1822 he published at Wilna two small volumes of poetry, afterward augmented, which contained some of the finest ballads in the Polish language, a historical epic, *Grażyna*, and under the title of *Dziady* a romantic autobiographical drama. This publication raised Mickiewicz to the highest rank in Polish poetry. He was idolized by the revolutionary youth of Poland, particularly after he was tried for participation in the secret associations of Zan, imprisoned in the Basilian convent at Wilna, and finally condemned in 1824 to perpetual banishment from his native country. He was removed to St. Petersburg, where he became familiar with the most distinguished Russian liberals, and subsequently to Odessa, whence he was allowed to make a tour through the Crimea. This he partly described in his "Sonnets," which were followed by his second epic, *Wallenrod*, published in 1828 at St. Petersburg, whither he had received permission to return. This poem, the theme of which is the struggle of the Lithuanians in the 14th century against their oppressors, the Teutonic knights, was favorably received in Russia, being also translated into the Russian language, and the author was even allowed to enter upon a tour through Germany and France to Italy for the restoration of his health. At Rome he received the news of the outbreak of Nov. 29, 1830; but he did not reach the confines of his native country until the struggle had ended, and he never again entered Poland. He went to Dresden, and there wrote the second part of *Dziady* (Paris, 1832), in which he described his imprisonment and the cruelties perpetrated by Russian tyranny on Poland. His next publication was *Księgi narodu polskiego i pielgrzymstwa polskiego* ("Books of the Polish Nation and the Polish Pilgrimage," 1832), which was followed by another poetical work, *Pan Tadeusz* ("Sir Thaddens," 1834), a picture of Lithuanian life and society in 1812 at the approach of Napoleon's invasion. He had lived for some years in Paris when in 1839 he accepted a professorship of classical literature at Lausanne; but in a year he returned to Paris to fill the chair of Slavic literature in the collège de France. He was now known as a zealous advocate of Roman Catholicism, from which he hoped for a regeneration of his country, as well as of Panslavic tendencies, which were not shared by all of his fellow exiles. His "Lectures on Slavic Literature," published both in French and German, gradually developed still more surprising phases. The inspiring genius of the poet was now a fanatical Polish priest, Towianski, who had mesmerized Mme. Mickiewicz in a dangerous illness in 1841, from which she recovered, and who, pretending to be enlightened by celestial visions, was followed by Mickiewicz as the Messiah of a new religion, in which the memory of Napoleon received almost divine honors. In order to gain over

Pius IX. to his schemes of national regeneration, he went to Italy in 1848, and at Florence received a flattering ovation. In 1851 he was appointed by Louis Napoleon sub-librarian of the library of the arsenal at Paris; and on the outbreak of the war against Russia he headed a Polish deputation to the French emperor, calling upon him to turn the great movement in favor of their oppressed country. Soon after he was sent on a secret mission to Constantinople, where he ended his career. His works have passed through numerous editions, and have been partly translated into other languages. His correspondence has been published in Paris (3 vols., 1870 *et seq.*).

MICKLE, William Julius, a Scottish poet, born at Langholm, Dumfriesshire, Sept. 29, 1784, died at Wheatley, Oxfordshire, Oct. 25, 1788. After pursuing various occupations and becoming bankrupt, he became in 1766 corrector of the Clarendon press at Oxford, and produced "Pollio," an elegy, and "The Concubine," a moral poem, the title of which was afterward changed to "Syr Martyn." He published a translation of the first book of the "Lusiad" in 1771, and in 1775 completed the work which has passed through many editions. His most popular productions are "Cumnor Hall," which suggested "Kenilworth" to Scott, and the song "There's nae luck about the house," the authorship of which has been disputed.

MICHACS, the most easterly branch of the Algonquin family of Indians, spread over northern New Brunswick, Nova Scotia, Cape Breton, Newfoundland, Prince Edward Island, and Gaspé. They were called by the early French writers Souriquois, and by the neighboring Indians "Salt Water Indians," as they always cling to the seacoast. The Indians taken to England by Cabot in 1497, and to France by Aubert in 1508, were apparently Micmacs. From a very early period they waged fierce war with the Little Esquimaux north of the St. Lawrence. They were expert canoe men, and lived by fishing and hunting. They knew maize and tobacco, but there was no cultivation of maize among them, or indeed east of Saco. When the French under De Monts began to settle Canada, the Micmacs were estimated at 3,000 or 3,500, and their greatest chief was Memberton, who is said to have seen Cartier. Missions were soon begun, and the French secured permanently the friendship of the Micmacs. They figure in many of the border wars, and after the English established Annapolis, the Micmacs destroyed Capt. Pigeon's force at Bloody Creek in 1711. They constantly plundered English vessels on the coast, in 1722 taking several in the bay of Fundy, and 18 in the harbors. They cruised along in their prizes, and actually engaged two British armed vessels sent out against them. They attacked Annapolis in 1724 and 1744, Port Lajoie in 1746, and the fort at Mines in 1749, capturing a lieutenant and 18 men; and in 1751 they took Dart-

mouth, opposite Halifax. Band after band made peace, but it was not till 1760 that the Richibucto Micmacs, the most warlike and formidable, laid down their arms. A series of treaties followed, and the Micmacs submitted to English rule. From 1783 to 1841 reservations were allotted to them in New Brunswick, and in other colonies attempts were made to induce them to become agricultural; but they were strongly averse to it, and in 1844 New Brunswick began a series of acts for selling the land. Nova Scotia and Cape Breton did the same, investing the proceeds for the benefit of the Indians. Catholic missions have existed among them from early times, and Protestant missions have been actively maintained for several years past. In 1873 the Micmacs were estimated at 1,765 in Nova Scotia, and 1,386 in New Brunswick; there were 400 on Cape Breton in 1861, and 70 in Newfoundland; so that they are about as numerous as they were 270 years ago. The Micmacs worshipped the sun. Papkootparout, the governor and ruler of the land of souls, was their great benefactor, having given them corn and tobacco. Glooscap is another great mythical character. Le Clercq, toward the close of the 17th century, found at Gaspé great reverence for the cross, and many theories were based on the fact; but Lescarbot many years before mentions their setting up crosses in imitation of the French. They made no pottery, had no hemp like neighboring tribes, made breech cloths and mantles of skins, strings for bows and fishing lines of intestines, and lodges of bark or skins. They had a system of hieroglyphics more compre-

I or we; thou; he; they;
 we are; they are;
 our Father; his father or who
is father; light, heaven; again;
 not; now; to-day;
 earth; may; also.

Micmac Characters.

hensive than has been found in other northern tribes. Le Clercq, seeing boys take down the prayers he was teaching them, adopted and improved these hieroglyphics, and as finally established they are still employed. Three books in this character have long been in use among them in manuscript, and one was recently printed at Vienna. A grammar of the Micmac language, by the abbé Maillard, revised by Belenger, was printed at New York in 1864; and portions of Scripture, tracts, and books of devotion have been printed in the language, some in phonetic characters and some in ordinary type.

MICROMETER (Gr. *μικρος*, small, and *μέτρον*, measure), an instrument applied to telescopes and microscopes for measuring minute spaces and objects.—*Telescope Micrometers.* A paper by Mr. Townley in the "Philosophical Transactions" for 1667 describes a micrometer with a movable wire which was constructed by a Mr. Gascoigne in England about 1640, and used by him in measuring the diameter of the moon and some of the planets. Gascoigne was killed in the civil wars in 1644, and as he left no account of his invention, it only became known through Mr. Townley, into whose possession one of the telescopes had fallen. This instrument was afterward improved by the celebrated Dr. Hooke, who is said to have added parallel hairs. A similar micrometer was afterward made by Azout, and another by the marquis of Malvasia. The instrument now in use under the name of the filar micrometer is constructed upon the same principles as either of the above, and may be understood by refer-

ence to fig. 2, which being held by the arms αx , attached to the box holding the spider webs, turns by means of the fixed toothed circle $g h$. The instrument is used as follows. Suppose it is desired to measure the angles of position and distance of two stars. The telescope is set on the objects, and the screw w is turned until the line $s t$ bisects the two stars. The milled heads $m m$ are then turned until the webs carried by the forks bisect each a star. The distance is indicated by the number of revolutions and parts of revolutions of the screws which separate the movable lines. The position is ascertained by a comparison of the reading of the position circle, $g h$, with its reading of the zero of position, which is when the lines are so placed that the image of a star will traverse the field from side to side, bisected by one of the lines, the telescope being at rest and the star passing by the diurnal motion of the earth. A modification of the filar micrometer is the most useful and accurate adaptation for reading the divisions on the limbs of large astronomical and geodetic circles. Huygens used a micrometer which employed a circular diaphragm in the focus of the eye glass, and whose angular value was ascertained by the time it took a star to pass across it. By using wedge-shaped plates of brass, some part of which exactly covered the disk of the planet, its diameter was found by a comparison with the size of the aperture. Fraunhofer's suspended annular micrometer is an ingenious, accurate, and convenient instrument, much used for objects, such as comets, faint stars, and asteroids, which will not bear the illumination necessary to render visible the lines in a filar micrometer.

It is shown in fig. 3, and consists of a disk of plate glass having in its centre a round hole about half an inch in diameter, to the edges of which a ring of steel is cemented, and afterward turned true in a lathe. When the disk is mounted in a brass tube and adjusted in the focus of the eyepiece of the telescope, the steel ring is alone visible, and appears as if suspended in the atmosphere. It is used to establish the position of an unknown object by comparison with one whose place is known, the transits of each being taken by turns, as it passes across the ring.—There are several other forms of micrometers, constructed upon various principles, and with reference to particular uses. The more important of these are the double-image micrometers, in which two single refracting lenses or semi-lenses are made to produce double images. When the centres of two images of the sun, moon, or any of the planets are separated so that the disks touch each other, the separation of the lenses will indicate the diameter of the object. Roemer is said to have been the first to suggest such an instrument, which had two whole lenses.

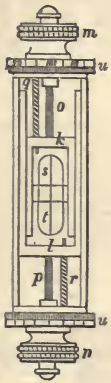


FIG. 1.

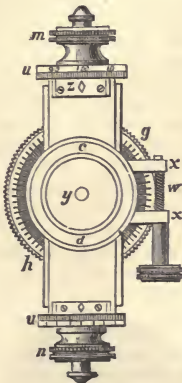


FIG. 2.

ring to figs. 1 and 2, drawn from instruments by Troughton of London. Fig. 1 represents a section transverse to the axis of the telescope. Two forks, k and l , are moved in a plane perpendicular to the axis of the telescope by means of the fine micrometer screws o and p . Each of these forks has stretched across it a spider's web which is placed in the focus of the objective. These webs are parallel, and being made to embrace any object, as the disk of a planet or the distance between two stars, the number of turns of the screws, which may be read by the graduated circles $u u$, will indicate the space measured, the value of a revolution of the screws having been ascertained by the time occupied by a known star in passing from one line to the other when placed at the distance of a certain number of revolutions, or by the measurement of some known space. Another web is stretched across the centre of the field, perpendicular to the other two. The position of these lines may be revolved about the axis of the telescope by means of the endless screw



FIG. 3.

Dollond's improvement consists in placing two half lenses side by side upon a sliding frame, and was called the divided object-glass micrometer. Other double-image micrometers are made of double-refracting crystals. This invention is ascribed to the abbé Rochon, rock crystal being the substance preferred by him on account of its transparency and hardness. Arago employed Rochon's micrometer in taking more than 3,000 of the diameters of the planets. A micrometer with double images was devised by Porro of Paris in 1842, which consists of a parallel plate of glass placed within the telescope so that part of the rays from the object pass through it and another part beyond it. An inclination of the plate will produce two images of the object, whose diameter may be measured by the amount of rotation given to the glass to produce certain alterations in the position of the image. A recent method for taking the positions and distances of stars, double or in clusters, is to photograph the telescopic field in collodion on glass, and then to measure the impression on the stage of an independent micrometer constructed for the pur-

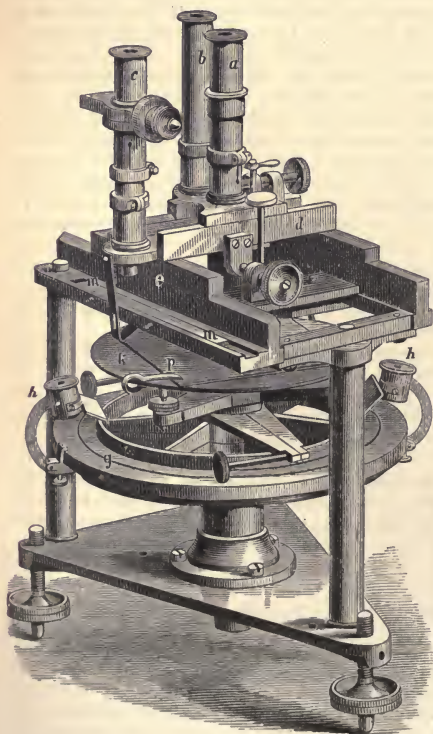


FIG. 4.—Rutherford's Micrometer.

pose. The great advantages of this method are that all the careful micrometer work can be done by an assistant who is not a professional astronomer; that it can be done during day or

night, and repeated at will, the photographs being imperishable; and that when done it is most accurate. An instrument of this kind, which has undergone several stages of improvement, was designed and constructed by Lewis M. Rutherford of New York several years ago. A sketch of the instrument as now in use at his private observatory is given in fig. 4. It stands upon a tripod, which may be accurately levelled by the milled head screws attached to the feet. The photographic plate, *p*, to be measured (five inches square), is clamped upon the circular glass stage *k*, which is supported by and revolves with the graduated position circle *g*, the verniers being read by the reading glasses *h h*. The compound microscope *a* is directed perpendicularly to the plate, and can be moved in two directions at right angles to each other and parallel to the plate, on the slides *e* and *d*. The quantity of such movement is read by the microscopes *c* and *b* upon glass scales of equal parts, *m*. (The scale read by *b* is not seen in the figure.) The fractions of a division are read by the filar micrometer seen at the eye piece of *c*. The eye piece of the microscope *a* contains a cross of spider lines by which it is centred upon the image of any star to be measured.—*Microscope Micrometers*. Most telescope micrometers may be used for microscopes when the eye glass has considerable focal length. Objects of known diameter are used, as lycopodium seed, or wire whose diameter has been measured by winding it many times around a cylinder, and dividing the length of the cylinder by the number of turns. A convenient micrometer was constructed by Dr.

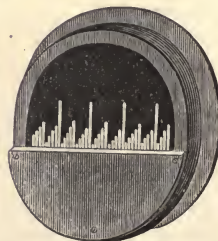


FIG. 5.

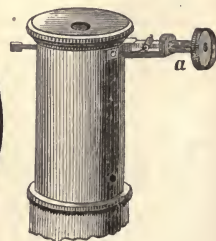


FIG. 6.

Wollaston, consisting of a scale, fig. 5, made of wires $\frac{1}{16}$ in. diameter, which occupies the place of the object, and a lens of about $\frac{1}{12}$ in. focal length in the cap of the instrument. The object, placed beneath this between two glass slides, is moved laterally across the field by means of the milled head *a*. (See MICROSCOPE.)

MICRONESIA AND MELANESIA (Gr. *μικρός*, small, *μέλας*, black, and *νῆσος*, island), terms derived from the size and complexion of the inhabitants, and applied by some geographers to arbitrary divisions of the islands of the Pacific ocean. These divisions are both comprehended in the better defined, more convenient, and better understood terms Australasia

and Polynesia. Micronesia and Melanesia occupy the western portion of the Pacific. The former extends from the westernmost island of the Hawaiian group to near Japan and the Philippines, and reaches S. of the equator, comprehending the Marshall and Gilbert groups, the Ladrões, and the Carolines. Melanesia embraces the Feejee islands, the New Hebrides, Solomon's islands, New Caledonia, New Britain, New Ireland, and Papua.

MICROSCOPE (Gr. *μικρός*, small, and *σκοπεῖν*, to see), an optical instrument for the examination of minute objects. Microscopes are of two kinds, simple and compound. With the former, the object is viewed directly, either by means of a single lens or a set of lenses employed in the same manner as a single lens. With the latter, an enlarged image of the object is formed by a single lens or a set of lenses, termed the object glass or objective; this image is viewed and further amplified by means of an eye piece or "ocular." Each form is valuable in its place, but as a general instrument of research the compound form, with all the modern improvements, is greatly superior. The invention of the simple microscope is not claimed by any one, but that of the compound has been warmly disputed; it is claimed by the Italians and the Dutch. The compound microscope of the present day, however, is a very different instrument from the disputed invention, and to this last and best form we purpose to devote the most of our attention.—The earliest magnifying lens known, if indeed it was used for this purpose, is the rude one found by Mr. Layard in the palace of Nimrud; it is made of rock crystal, and is far from perfect. Seneca (*Questiones Naturales*, lib. i., cap. vi.) alludes to the magnifying power of a glass globe filled with water; he ascribes the effect to the water, and appears to refer to objects immersed in the water; this was about the middle of the 1st century. "Burning spheres," as they are termed by Aristophanes, were sold in the shops of Athens in his day, about 400 B. C. There is no evidence that lenses were employed at this early date for magnifying, at least otherwise than as reading glasses. It is not until the 17th century that we find powerful magnifiers of glass actually employed for scientific investigation. The names of Malpighi, Lieberkühn, Hooke, Leeuwenhoek, Swammerdam, Lyonnnet, and Ellis are closely connected with the history of the simple microscope; and their important discoveries attest the value of even this form of the instrument. Most of the magnifiers employed by the early observers were minute single lenses of glass; often small spheres formed by melting threads of glass in the flame of a spirit lamp. The small single lenses of high power are usually plano-convex, the plane side toward the object; when carefully made, having a focal length of from $\frac{1}{16}$ to $\frac{1}{32}$ of an inch, and well set in shallow blackened cells, with the proper aperture, they perform on ordinary

objects tolerably well; much better than the minute glass spheres, as the latter are difficult to obtain free from bubbles. The writer has succeeded better by melting a fragment of plate glass in a small hole in a German silver cup, by means of the blowpipe, and has formed lenses in this way, ready mounted for use, quite equal to those ground and polished by hand. The German silver is blackened by the heat. In order to diminish the spherical aberration in the high magnifier of a single refracting substance, Sir David Brewster suggested the employment of gems; and Mr. Pritchard of London, under the patronage of Dr. Goring, ground lenses of garnet, sapphire, and diamond, all of which proved superior to glass lenses of equivalent focus. The diamond lenses upon the whole were inferior to the sapphire; the latter, though not as highly refractive, were free from the veins which rendered several of the diamond lenses useless, though still affected, in common with the diamond, by double refraction. The garnet lenses are free from this latter defect, and when very minute are much superior to glass; the color is not objectionable when the lenses are very small. All the magnifiers composed of single lenses, glass or gems, are surpassed by the doublets and triplets. The invention of the doublet in its best form is due to Dr. Wollaston; it appears, however, to have been a chance discovery. It consists of two plano-convex lenses, having their plane sides toward the object; the posterior lens (that nearest the eye) is three times the focal length of the anterior, and the distance between them is twice the focal length of the shorter. It is evident that the front lens of the doublet must be approached much nearer to the object than if it had been used alone, and the amplification is also less than that of the front lens alone; hence the working distance is much less than that of an equivalent single lens. The great and surpassing advantage of the doublet is the enlarged angle of aperture and diminution of spherical aberration. By "angle of aperture" is meant the angular breadth of the cone of rays proceeding from the object, and refracted through the lens or set of lenses. Evidently, with a single lens, having an aperture equal to its focal length, the angle will be about 55° ; in other words, the lines drawn in the same plane from a point to the margin of the lens, this point being in the axis of the lens, and at a distance from its convex surface equal to the diameter of the lens, will be 55° ; no single lens, however, will admit anything like this aperture. In the doublet the front lens is approximated much closer to the object than it possibly could be if employed alone, and hence it admits a wider angle; the reduction of magnifying power, at the same time, diminishes spherical aberration, which is still further reduced by the peculiar relations of the curvatures. The doublet thus becomes a very superior instrument, and, when well made and

carefully used, surpasses all but the most improved forms of the compound instrument. Doublets of gems are far superior to those of glass. Triplets are superior to the doublets; and for a simple microscope the achromatic triplets now furnished by the French and German opticians, as objectives for the compound microscope, will be found very effective. Essentially, the English and American achromatic objectives are triplets, but the peculiar mounting of these instruments prevents their use as simple microscopes. So great has been the improvement, that the best modern objectives will transmit angular pencils of 170° to 178° . We may notice here the so-called "Coddington lens," or grooved sphere. It is an invention of Sir David Brewster, and when properly made is almost free from spherical aberration, and the chromatic aberration is almost insensible. "It consists of a spherical lens, or sphere with a deep concave groove cut round it, so as to cut off the marginal pencils, and thus give a wider field and more perfect image." The lenses usually sold under this name are simply cylinders of glass having spherical ends, and of course have none of the advantages of large field and freedom from spherical aberration proposed by Dr. Brewster. When the curvatures of this cylindrical lens are unequal, and such that, the most convex being turned toward the eye, an object placed on the other convex surface is in the proper focus of the lens, it is called a "Stanhope lens;" its use is limited to such objects as can be directly applied to the surface. When of considerable power it may be advantageously employed in searching for *diatomacea*; the drop of water supposed to contain them may be examined by applying it to the less convex surface.—All the simple microscopes, and especially the higher powers, require some kind of a stand or carrier. The lower powers and single lenses are usually attached to the end of a jointed rod, which can be moved up and down a stem inserted into a solid base. The most convenient mounting for an inch or half-inch lens, for preliminary examinations or botanical dissections, is that of Messrs. Powell and Lealand of London, and is employed as the mounting of the small condenser for their compound instrument. The movements are complete, and one can place the lens, whatever may be the position of the object, in such a relation to it as will insure the best view. For the higher powers, $\frac{1}{4}$ to $\frac{1}{16}$ of an inch, a steady well made stand will be required, and some means of adjusting the focus delicately, either by rackwork or screw. Various forms have been devised; perhaps, upon the whole, that known as the "Raspail" is most simple, and at the same time of great excellence. It consists of a brass pillar, up and down which a large circular stage is moved by rackwork; a large mirror, one side plane, the other concave, swings freely below, and serves to direct the light upon the object; at the top of the brass

pillar is placed the lens holder, movable forward by means of a screw, and laterally by swinging round a pin inserted in the top of a pillar; into the opening of the stage is fitted a glass plate, or it may be made to hold dissecting troughs with glass bottoms. It is often convenient, or absolutely necessary, for the examination and dissection of opaque objects, to have the lens inserted in a silver cup or Lieberkühn, which, receiving the light from the mirror below, reflects it back, condensed, upon the object. These Lieberkühns are usually made of silver. The very simple microscope employed by Ellis in his researches on coralline, in which all the adjustments were effected by sliding by the hand, was fitted with these silver cups. Although the Lieberkühn is very commonly applied to the low power achromatic objectives, it is now seldom to be obtained with any form of simple instrument, unless by special order; it will be found of the greatest service in minute dissection.—In using lenses of moderate focus, three fourths to one eighth inch, the most extended distinct field is obtained when the convex side is presented to the object; but the sharpest vision of a minute point or small object, in the centre of the field, is when the flat side is presented to the object. In estimating the magnifying power of single lenses, an arbitrary standard of the nearest distance at which the healthy unassisted eye can view distinctly minute objects is assumed; this distance has been placed at from 5 to 10 in. The latter is the standard adopted by most opticians and authors; Sir David Brewster alone adopts 5 in. The magnifying power is obtained by dividing 10 in. by the solar focal length of the lens, and is usually expressed lineally, or as "so many diameters." Thus, when the magnifying power is stated to be 40, it is meant that the diameter is increased 40 times, but of course the area would be increased 1,600 times. The following table exhibits the linear and superficial magnifying power, adopting the standard of 10 in.:

Focal lengths in inches.	Linear magnifying power.	Superficial magnifying power.
2	5	25
$1\frac{1}{2}$	6.6	48.5
1	10	100
$\frac{3}{4}$	13.8	176.8
$\frac{2}{3}$	20	400
$\frac{1}{2}$	40	1,600
$\frac{3}{8}$	80	6,400
$\frac{1}{4}$	100	10,000
$\frac{1}{10}$	200	40,000

As it is difficult to measure exactly the solar focal length of small lenses, a sufficient approximation may be had by the method proposed by Mr. Ross, which answers admirably for doublets and triplets. It consists in "viewing the image of some distant object formed by the lens in question, through another lens of one inch solar focal length, keeping both eyes open, and comparing the image presented through the two lenses with that of the naked eye.

The proportion between the two images so seen will be the focal length required. The panes of glass in a window, or courses of bricks in a wall, are convenient objects for this purpose." The comparative focal lengths of two lenses, or sets of lenses, may be determined by holding them at the same distance from the eye and estimating the size of the image formed by each of the same object; thus, if one lens forms the image half the size of the other, lineal measure, its focal length is half that of the other. The same method applies to eye pieces.—For a history of the earlier forms of the compound microscope, the reader may consult the elaborate works of Quekett and Harting and the older works of Adams and Baker. Essentially it consists of two parts, the object glass and the eye piece. The former

is now made by a combination, usually, of three sets of achromatic doublets, arranged to give the greatest freedom from spherical and chromatic aberration; the latter, of two plano-convex lenses, with the plane sides to the eye, the lens nearest to the object, or "field lens," being almost exactly double the focal length of the eye lens, and the distance between them a little more than the focal length of the field lens; the ratio is varied somewhat by different makers. In fig. 1, the object placed at P, on the stage T, is illuminated by converging rays, b, b, b , reflected from the mirror S. At L is the compound achromatic object glass. C is the field lens, and A the eye lens of the eye piece. With the eye lens one views the image of the object, P', formed by the object glass. The eye piece thus formed is termed a "negative eye piece," or the "Huygenian." The eye piece of Kellner is a decided improvement; it is termed "orthoscopic," and the eye lens is achromatic or nearly so; these eye pieces are supplied by the Messrs. Grunow of New York, with their best instruments; the field of view is large, free from distortion, and well defined throughout the whole extent. The orthoscopic eye piece supplied by Mr. Charles A. Spencer of Canastota, N. Y., and more recently as improved by R. B. Tolles of Boston, has both eye and field lens achromatic, and is exceedingly perfect; it is, however, more expensive than

the Kellner eye piece. Mr. Tolles has introduced a "solid, orthoscopic, negative eye piece, of remarkable clearness and definition throughout, especially fitted for micrometric use, the engraved scale being cemented in the body of the solid eye piece, and perfectly protected from all dust or interference with definition, so noticeable in the use of the eye-piece micrometer in the ordinary way. Mr. Tolles has also introduced what is termed an amplifier, being an achromatic concave of peculiar construction, which is introduced within the body of the microscope by means of an adapter. The corrections of the objective are not in the least disturbed by this arrangement, but the power is doubled. A low eye piece thus gives as much amplification as a higher one, and with the very great advantage of almost perfect flatness of field. The object glasses, or "objectives" as they are now very commonly termed, derive their denominations, 1 inch, $\frac{1}{2}$ inch, $\frac{1}{4}$ inch, &c., from the fact that the combined sets of lenses give a magnifying power the same as a single lens of the same name. Thus, a $\frac{1}{2}$ object glass should give the same amplification as though a single lens of $\frac{1}{2}$ inch was used in its place. This term does not refer at all to the working distance, for, as is the case with doublets, the working distance with all powers higher than the $\frac{1}{2}$ inch is considerably less than that of the equivalent single lens; it will be apparent that for any given focus the working distance will, in general, be diminished by an increased angle of aperture; a $\frac{1}{4}$ of 90° will have in this respect a very great advantage over a $\frac{1}{2}$ of 140° . As regards the merits of the large angle objectives, there are various opinions. Dr. Carpenter is decided in his condemnation, considering that depth of penetration cannot be had at the same time with enlarged angle. The skill of the first opticians, Spencer, Tolles, and Wales in America, Ross, Powell and Lealand, and Smith, Beck, and Beck in England, have proved the contrary. Nor is Sir David Brewster's assertion true of large angle objectives, that they give a distorted view. The definition, clearness, and perfectness of vision with Powell and Lealand's $\frac{1}{4}$ inch, having an angle of 176° , when employed with a low eye piece so as to give the same amplification as a $\frac{1}{2}$ with a higher, is greatly superior to that of the $\frac{1}{2}$. The chief advantage of the small angle has been considered to be the sort of general view it would give of the whole of a minute object; the working distance being so great that the minute elevations and depressions in the object itself, being but a very small fraction of the whole distance, would not perceptibly affect the focus. In many respects this might be a desirable quality; but the microscopist would quite as often find it a source of error in his interpretation of what he might observe, and he will find it safer to decide as to the elevations and depressions of an object by the removal and approach required to be given to the object glass,

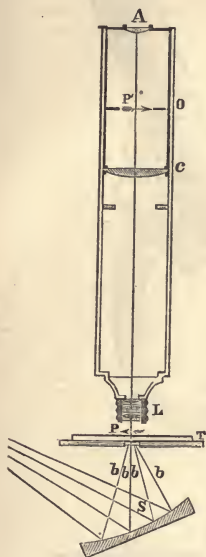


FIG. 1.

achromatic object glass. C is the field lens, and A the eye lens of the eye piece. With the eye lens one views the image of the object, P', formed by the object glass. The eye piece thus formed is termed a "negative eye piece," or the "Huygenian." The eye piece of Kellner is a decided improvement; it is termed "orthoscopic," and the eye lens is achromatic or nearly so; these eye pieces are supplied by the Messrs. Grunow of New York, with their best instruments; the field of view is large, free from distortion, and well defined throughout the whole extent. The orthoscopic eye piece supplied by Mr. Charles A. Spencer of Canastota, N. Y., and more recently as improved by R. B. Tolles of Boston, has both eye and field lens achromatic, and is exceedingly perfect; it is, however, more expensive than

in order to bring successively these elevations and depressions into distinct view. In minute and elaborate investigations the high angle objectives are the most trustworthy. Moreover, the skill of the opticians named has enabled them to increase the angle without diminishing so very much the working distance. The $\frac{1}{4}$ of Mr. Ross, and we believe the $\frac{1}{4}$ of Powell and Lealand, will work through glass $\frac{1}{10}$ of an inch thick.—In speaking of the objectives of the prominent makers, we do not desire to indicate any order of precedence; they are all excellent, and all have peculiarities of their own. We must, however, be permitted to notice a little more fully the American artists. The oldest optician, and the one who has been most known in connection with the microscope in the United States, is Mr. Charles A. Spencer of Canastota, N. Y. The object glasses furnished by him, particularly the later ones, are of the highest order; they range from 3 in. to $\frac{3}{8}$ in. By many of our most experienced microscopists they are considered superior to the best objectives of the London opticians; they are certainly equal to them. Mr. Spencer, in the earlier days of high angle objectives, no doubt surpassed in this respect all the English opticians; his rare skill and nice manipulation enabled him to perform wonderful feats in this direction, far in advance of anything before accomplished. Mr. Robert B. Tolles, for some time connected with Spencer, but now by himself at Boston, has devoted himself to the perfection of the achromatic objectives with enthusiastic zeal and unparalleled success. His recent objectives are quite equal in defining and penetrating power to the very best of the London opticians, both with central and oblique illumination, and greatly superior to them in the latter case, as regards chromatic aberration; this is true also of Mr. Spencer's objectives. Mr. Tolles's objectives range from 3 in. to $\frac{1}{8}$ inch; the latter objective is a marvel of optical art. Messrs. J. and W. Grunow of New York have sent out some very fine objectives, ranging from 2 in. to $\frac{1}{8}$ in. They have not attempted generally so high angles as Spencer and Tolles, but have devoted great attention to the mechanical arrangement and efficiency of their stands, and the accessory apparatus. Mr. William Wales came to this country in 1862, and settled at Fort Lee, N. J. His objectives are known the world over for their excellence; and among Tolles, Wales, and Powell and Lealand it is now impossible to assign any superiority in the performance of their lenses. The superior workmanship and elegant form of the stands made by Mr. Joseph Zentmayer of Philadelphia are perhaps not equalled, certainly not surpassed, by the production of any other maker. (See fig. 2.) Among other improvements given by this artist to the working microscopist we would specially mention the remarkably thin and steady stage of his "grand American microscope," his invaluable

glass stage, and his mechanical finger for picking up and arranging diatoms. The latter invention, described in the "American Journal of Science" for May, 1870, is an improvement on the invention of the distinguished American microscopist Prof. H. L. Smith, described in the same journal for May, 1866. Of English opticians, the name of Andrew Ross has always been placed foremost, being connected with the greatest improvement of the objective, without which the higher powers of large angle would be almost valueless; we allude to the adjustment for cover. First of all the

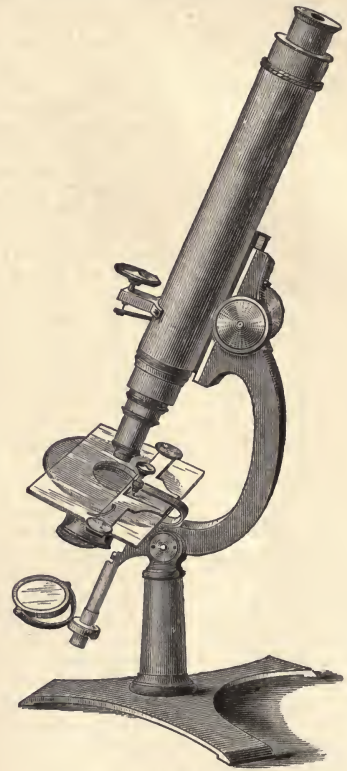


FIG. 2.

opticians Mr. Ross made his objectives so perfectly corrected for spherical and chromatic aberration, that a new source of difficulty, apparently almost insurmountable, presented itself. He found that these aberrations, so nicely balanced, were disturbed by each varying thickness of the thin covering glass over the object. The expedient he devised to remedy this, was to alter the distance between the first set and the two posterior sets of achromatics composing the objective, by means of a delicate screw collar. This grand and capital improvement, for which Mr. Ross deserves the rank assigned him, has been adopted by all

the American and English opticians, and more recently by the French and German. The English uniformly, if we except the amateur efforts of Mr. Wenham, make the front set movable; the American opticians generally move the two posterior sets, the front being immovable; the latter method is better, the object being kept easier in view during the adjustment, and there being no danger of bringing the front lens in contact with the object. The objectives of Mr. Ross have always maintained a high character, and have been more expensive than those of Powell and Lealand, or Smith, Beck, and Beck, though they probably do not surpass them. The business is now conducted by Mr. Thomas Ross and Mr. Wenham. Mr. Ross's objectives range from 3 in. to $\frac{1}{12}$ inch. Messrs. Powell and Lealand, so far at least as the objectives and accessories are concerned, are quite equal to any living opticians. Both the low and high powers of this firm are of the finest character. While the general plan is the same, there are some peculiarities in their high power objectives worthy of notice. The front set is triple, and the front lens, being of crown glass, is less liable to injury from wiping, or accidental contact with the object, than the soft flint of other opticians; but as it is a very thin plano-convex, merely cemented to the concave, and not burnished in, it is liable to injury by parting the cement. Messrs. Smith, Beck, and Beck (now R. and J. Beck) are more widely known in this country than the other firms. Their "students'" and "educational microscope" are the forms usually sold by the dealers. As opticians, for the lower power objectives, they stand side by side with the others named. They did not until lately furnish objectives higher than $\frac{1}{8}$, of 125° angle. We can only mention the names of Nachet, Oberhauser, and Kellner, whose objectives are excellent, but inferior to the American or English; they are, however, much cheaper, and the mechanical work upon their instruments is very excellent. The name of Prof. Amici of Modena was long associated with the microscope. The objectives made by him consisted of six series, with angles varying from 26° to 160°; the higher powers had no adjustment for cover, but the front lens was slightly concave, and a drop of water introduced between the cover and the objective, thus in a measure rendering the adjustment unnecessary. The marked advantage in the plan of Prof. Amici, of introducing a stratum of water between the front lens of the object glass and the thin glass covering the object, was fully shown by its originator 12 or 14 years ago; but it was only after Nachet of Paris adopted the idea and thereby greatly improved the working of his objectives, that opticians viewed Amici's principle with favor. E. F. Hartnack of Paris, the successor of Oberhauser, at once adopted the "immersion" system, as it is called, and soon came to the very front of all objective makers. The ad-

vantage of this system is well stated by Harting: "As the water is a stronger light-refracting medium than air, the reflection of the rays of light is much diminished at the under surface of the objective; indeed it almost entirely ceases. Hence more rays of light pass into the microscope, and the thin stratum of water has nearly the same effect as an enlargement of the angle of aperture. This favorable modification influences chiefly the peripheral rays, which fall most obliquely. The peripheral rays have most influence on the formation of the image, which takes place in front of the eye piece; and as, by their passing through a transparent object, they are for the most part deflected from their course, and the slight deviations thus caused become visible in the image, the defining power of the microscope must necessarily be increased by the stratum of water." The magnifying power as well as the angle of aperture is increased by the stratum of water in which the objective is immersed, for the water acts like the cover glass, and the lenses must approach each other in proportion to its thickness. The advantage of an immersion lens over the ordinary dry objectives cannot be better shown than by the following experience of Dr. J. J. Woodward, United States army. He had three superior lenses, all made by Powell and Lealand: a $\frac{1}{32}$ and a $\frac{1}{16}$ dry lenses, and a $\frac{1}{16}$ immersion lens. The former lenses could resolve only the 15th band on Nobert's 19-band test plate, but the $\frac{1}{16}$ immersion lens not only resolved into lines this 15th band, but also the 16th, 17th, 18th, and 19th bands. Finally, we must not omit to name Mr. Lister, who first pointed out some peculiarities possessed by a combination of three achromatics with their plane sides toward the object, the crown and flint being cemented together, and which were the basis of subsequent improvements. The peculiar form adopted by Lister has long since been abandoned; but the principles are the same.—The stands furnished by the principal makers exhibit a great variety of patterns, and combine various excellences. The most desirable points, viz., freedom from tremor, ease of illumination, particularly oblique illumination, facility in the application of the accessory apparatus, and delicacy of adjustment, are nearly equal in the first-class stands of the principal opticians; but perhaps, on the whole, the best are those of Mr. Zentmayer and of R. and J. Beck. Their large stands mounted on two pillars are remarkably steady. The stage, thin but substantial, is large, and its movements are very smooth and delicate. The illuminating and accessory apparatus is carried by a sub-stage below, and most easily applied. The illuminating mirror is large, and so mounted as to give very oblique illumination. The rackwork of the quick adjustment is always of the smoothest and best character in all of the instruments made by these firms, and the slow adjustment very delicate. The greatest fault

in their stands is the attachment of the slow movement at the lower part of the tube of the microscope itself. In this respect the stands of Ross, Powell and Lealand, Spencer, Tolles, and the Messrs. Grunow are superior. With the high powers, the springing of the tube when the finger is applied, and the shaking when the adjustment for cover is attempted, are disagreeable. The larger students' microscope made by Beck is a very fine instrument; the stage movements and adjustments are very complete. The stands furnished by Ross are heavy and cumbersome; they are, however, exceedingly steady, and finished with extreme care. Those supplied by Powell and Lealand are much lighter, and have some peculiar advantages. The accessories supplied by this firm are more complete than those of any other; the stage of their new and largest instrument is very thin, and allows greater obliquity of illumination than that of Beck. Their achromatic condenser is beautifully finished; it has an angle of 170° . The stand itself is not as steady as that of Beck, but the fine adjustment is more conveniently placed. The stands furnished by Messrs. Grunow are of different patterns, but all excellent in beauty of finish, smoothness of adjustment, and steadiness, comparing most favorably with the English work. The stands furnished by Spencer and Tolles have many excellences, and are very steady.—All good instruments should have a graduated draw-tube within the main tube, and the latter should be not less than 1.4 inch in diameter. The draw-tube is absolutely necessary for micrometry, and is very convenient to receive the analyzing prism, erector, or Tolles's amplifier. Two adjustments for focus are also necessary, one quick by rack-work and pinion, the other very delicate by screw. The pinion heads should be large, to allow of most delicate movement, and Messrs. Beck and Zentmayer graduate the head of the screw of the fine adjustment, so that the thickness of covering glass may be measured. A skilful observer may dispense with the rack movement, and produce the approximate adjustment by sliding the tube. This is the method adopted in most of the French instruments, and in the "educational" of Beck. The stage movements should be smooth, and but slightly disturb the adjustment when in focus. The adjustment for wear in the English instruments is by spring, in the American by screws; the former involves more work for the maker, but is better. The lever stage, though performing finely when first from the hands of the maker, is much more liable to derangement than that in which the motions are produced by rack and screw. In the Beck instruments the rack and screw are both so low that the latter passes entirely under the bottom of the stage, which is consequently much thinner than it can be made when the screw is introduced between the movable plates; the milled heads themselves are thus

dropped below the level of the stage, and this is deemed of great importance; this is also the case with Powell and Lealand's large microscope.—One of the most important of recent improvements in the microscope has been the adaptation of the instrument to stereoscopic binocular vision. The binocular microscope, as we now have it, is the result of gradual progress in the application of Prof. Wheatstone's discovery of the stereoscope, from the year 1851, when Prof. Riddell of New Orleans first attempted the production of micro-stereoscopic relief, to the recent simple and universally used invention of Mr. Wenham. M. Nachet, Prof. H. L. Smith, Messrs. Powell and Lealand, Mr. Tolles, and Dr. Barnard have also devised special plans to obtain the same effects. Some of them have their own special advantages, but Mr. Wenham's recent invention is

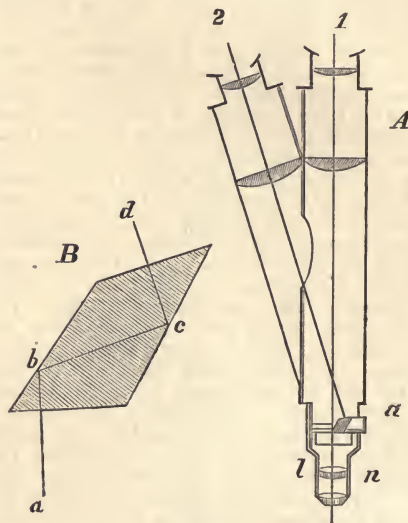


Fig. 3

so simple that it has been almost universally adopted by American and English makers. We will therefore only describe here his invention, and refer the reader who desires information of the plans of the above named gentleman to Beale's "How to Work with the Microscope" (London, 1868); to Carpenter "On the Microscope" (London, 1868); and to the report of Dr. F. A. P. Barnard "On Machinery and Processes of the Industrial Arts, and Apparatus of Precision," exhibited at the Paris exposition of 1867. The pencil of rays which has passed through the objective *ln* is cut in half by the interposition of a trapezoidal prism *a*, as shown in fig. 3, *A*; half of the rays of the pencil pass up the tube as usual, and the other half enter the anterior face of the prism and are reflected from the lateral surfaces *b* and *c*, and emerge at *d* to

proceed up the secondary tube 2, as shown in fig. 3, B. To obtain stereoscopic effect it is absolutely necessary, on account of the crossing of the rays of the pencils in the objective, that those rays which have emanated from the right-hand half of the cut pencil should enter the left eye, and *vice versa*. If this does not take place, we shall have, instead of stereoscopic relief, a pseudoscopic effect; that is, elevations will appear as depressions and depressions as elevations. This was the case with Prof. Riddell's invention and with the first plan adopted by Mr. Wenham. In Mr. Wenham's recent invention, which we have just described, this is avoided by causing the rays reflected from the face *c* of the prism to cross those going directly up the tube, so that the right eye receives the left half of the pencil, and the left eye the right half. The distance between the oculars 1 and 2, fig. 3, A, is adapted to different eyes by means of racks and a pinion, by which they are moved inward or outward. There are two great advantages in using the binocular microscope: first, the eyes are subjected to equal work, and thereby are not so liable to fatigue and injury; secondly, with low powers we obtain an insight into the three dimensions of a body, for in the stereoscopic binocular we see into the depth of a body as well as view its length and breadth. This is very important in the study of tissues, as we see how they are arranged in order of distance from the surface of the body.—The usual accessories accompanying the microscope are: an achromatic condenser, a bull's-eye condenser, small condenser, stage and eye-piece micrometers, polarizing apparatus, camera lucida, animalcule cage, stage forceps, glass parabola, erector, Lieberkühns and dark wells, frog plate, &c. The name of achromatic condenser has been given to an illuminating apparatus consisting of an achromatic objective of large angle, furnished with a wheel of diaphragms and central stops; when the latter are used, oblique illumination is obtained. This condenser is exceedingly useful in the ordinary studies by the microscope. With the proper adjustment it affords a fine achromatic illumination, revealing the structure of the object with great beauty and clearness; but in unskilful hands it will be of little service. So far as oblique illumination is concerned, we prefer unilateral light, though some particulars of structure are best revealed by aid of the achromatic condenser. The condenser is placed below the main stage, and can be adjusted by independent rackwork, so as to give the best illumination. The condenser of 170° angle, introduced by Powell and Lealand, is spoken of very highly by the English microscopists; the delicate markings of *navicula rhomboides*, when viewed with their $\frac{1}{4}$ objective, are said to be as well defined as those of *pleurosigma hippocampus* viewed with a $\frac{1}{2}$. The achromatic condenser of Beck has an angle of about 100°. When used with the central

stops, the proper point for adjustment may be determined by removing the eye piece, after the objective has been brought into focus, looking down the tube, and moving the condenser by means of its own rack and pinion, until the black stop appears sharply defined in the centre of the field, and a bright illuminated ring around it. If the stop is removed, the whole field will appear brightly illuminated, unless the objective be of much greater angle than the condenser. A condenser of greater angle than 100° cannot be used unless the object be placed upon very thin glass; all difficult test objects should be mounted in this manner on a slip of mahogany, or on a perforated glass slide. The condenser itself, or the carrier, should have some means of adjustment to make its axis coincide with that of the objective; the front set of lenses is generally made to be removed, thus affording an illuminator of lower angle, to use with thicker glass and objectives of low power. In using the achromatic condenser by lamp light, the bull's-eye condenser is employed to render the rays parallel, and the plane side of the mirror is used. The bull's-eye condenser consists of a thick plano-convex lens, of short focus, mounted upon a stand so that it can be used for the illumination of opaque objects. Very excellent oblique illumination may be obtained by condensing the flame of a candle or lamp, placed about two feet from the stage, upon the under surface of the slide, the light being placed in front, and the stage slightly turned up to receive it; or, the microscope being placed horizontal, the light may be off at one side, according to the obliquity desired. As the thickness of the stage will not ordinarily allow illumination at a much greater distance than 60° from the axis, a sub-stage, attached to the upper plate of the main stage, but carrying the slide entirely below it, is furnished by Messrs. Grunow and by Powell and Lealand, and may be readily attached to any microscope; this allows illumination of any obliquity. In using the bull's-eye condenser for this purpose with a lamp, the plane side must be presented toward the object; and if the flame be flat, its edge must be presented. The small condenser is used in the same way as the bull's-eye. Where very intense illumination is desired, the bull's-eye is placed near the source of illumination, with the plane side toward it, so as to render the rays nearly parallel, and then this beam of light is further condensed by the small condenser. An achromatic lenticular prism of short focus is very valuable for illumination. The prism should be so mounted that it can be placed to reflect converging rays on the object at any angle, and in any position, both below and above the stage. Experience in its use will to a great extent supply the need of an achromatic condenser.—The stage micrometer is a slip of glass ruled into .01" and .001" of an inch; it is used in conjunction with the camera lucida, or to determine the value of the

divisions of the eye-piece micrometer. The French scale is the millimètre divided into 100 or 200 parts. The eye-piece micrometer, known as Jackson's micrometer, is a finely ruled glass scale, introduced by means of an opening between the field and eye-lens of the eye piece, so as to be in the focus of the eye lens. The value of the scale is determined by placing the stage micrometer on the stage, and viewing the divisions with the given objective and eye piece; thus, if 10 divisions of the eye micrometer corresponded with one ($\cdot 01''$) of the stage micrometer, then the value of one division of the eye-piece micrometer would be $\cdot 001''$ with that particular object glass and eye piece. The stage micrometer being replaced by any object, its dimensions may be readily ascertained by noticing how many divisions of the scale are subtended by it. The micrometers of this description are very convenient, and, when carefully used, accurate. The definition is slightly injured, however; this objection is obviated by Mr. Tolles's solid micrometer eye piece. If the observer has only a stage micrometer, the divisions may be projected on paper by means of the camera lucida; then, with the same objective and eye piece, the image of any object being projected on the paper, its dimensions are at once ascertained. Messrs. Powell and Lealand furnish a cobweb micrometer susceptible of great accuracy; it is similar to that used for astronomical purposes. Messrs. Grunow have somewhat improved upon Powell and Lealand, and their cobweb micrometer with orthoscopic eye piece is very delicate. They also furnish Fraunhofer's stage micrometer, which has the advantage of giving the absolute dimensions of the object, without reference to the power of the objective or eye piece. With careful use the eye-piece micrometer is as accurate as any of these, and much less expensive.—The polarizing apparatus consists of two Nicols prisms of calc spar with revolving fittings, one (called the polarizer) designed to be placed below the object, the other (termed the analyzer) above, either directly over the eye piece, where it generally cuts off part of the field, or at the lower end of the draw-tube; here, if the prism be good and not too long, it will not much affect the definition, and will allow the whole field to be visible. Very much depends upon these prisms. Those supplied by the Messrs. Grunow are very large and fine, and the analyzer is placed by them directly above the objective; it is too large, however, to be placed so low down without injury to the definition. Beck's analyzer is much shorter than Grunow's, and may be used either over the eye piece or placed in the end of the draw-tube. There is much difference in these prisms; some scarcely injure the definition at all, and others are very poor. The polarizer is usually somewhat larger than the analyzer. The calc spar is very soft, and, if not protected by thin glass covers, liable to injury. A set of revolving selenites, to go below the object, between

it and the polarizer, accompanies the prisms. There is not much choice in the method of mounting and revolving these prisms; perhaps Grunow's is the most elaborate, but, when the revolving selenites are included, we think Beck's arrangement the most complete. A "selenite stage" is often employed, simply placed under the object, on the stage of the microscope. Mr. Darker has contrived a stage of this kind, in which the selenites revolve. A complete polarizing apparatus is very important, and should be attached to every good instrument. Sometimes tourmalines are used instead of the prisms of calc spar; they are objectionable on account of their color, but placed over the eye piece do not at all obstruct the field of view.—The camera lucida furnishes the means of drawing or sketching outlines of objects viewed in the microscope, some provision for which is absolutely necessary. Often this is merely a plate of neutral tint glass, which, placed in front of the eye piece, at an angle of 45° , when the microscope is turned horizontal, reflects the image to the eye, and at the same time pencil and paper upon the table may be viewed through the glass. A better contrivance than this is the steel disk of Sömmering, made slightly smaller than the pupil of the eye; this, when placed in front of the eye piece, enables one to view object and paper at the same time. In these contrivances, and also in the Næcht drawing prism, the object, being viewed after but one reflection, is reversed right and left. Where it is necessary to finish a drawing by the eye, this is a serious difficulty; it is therefore preferable in all cases to use the Wollaston prism, which is applied so as to give an unobstructed view of the whole field, and with which the drawing is precisely as it appears in the microscope without the prism. A little practice is required to use it well, but if the observer will take care to have the paper strongly illuminated, while the object is only enough illuminated to be seen distinctly, no great difficulty will be found. But whoever does much original work with the microscope should not depend on drawings made with the camera lucida, but should learn to photograph the objects he has discovered, or the histological preparations he has made. The eminently successful work of Drs. Edward Curtis and J. J. Woodward, at the army medical museum in Washington, should encourage all who have the means to adopt this accurate method of permanently securing the results of their labors.—The animalcule cage is a simple contrivance by means of which a drop of water may be retained between two glass plates, which may be approximated so as to just confine the object, without allowing, if it be living, too much freedom of movement; it is often made to serve the purpose of a compressor, for crushing soft bodies more or less during the examination.—The stage forceps is exceedingly useful for the examination of small insects. At one end is usually placed a bit of

cork, enclosed in a brass cylinder pierced with holes, to receive an insect pin, in case it be desirable to examine cabinet specimens. The forceps should have free movement in all directions. The recent ones supplied by Beck have a ball and socket movement; they are attached to the upper stage plate, and thus are moved by the rack and screw of the stage.—The parabola was originally contrived by Mr. Wenham, and was composed of a silver reflector; it is now made of glass, the outer surface having the form of a parabola. The rays of light, entering the glass through a plane surface below, suffer total reflection, and emerge without refraction, the upper surface of the truncated parabola being concave, so that each reflected ray strikes upon the surface perpendicularly. The glass parabola has a small hole in the axis, carrying a sliding rod, with a small disk, which may be elevated or depressed according to the angle of aperture of the objective, until the direct light is excluded; the object is then exhibited entirely by oblique light on a dark field. The *polycystina* are beautifully shown by this illumination, and also parts of insects with the lower powers.—The erector consists of two plano-convex lenses, to be inserted into the lower end of the draw-tube; by means of these the object is seen without being inverted. The magnifying power is much diminished, and the definition injured; and one who intends to dissect under the compound microscope, had better at once learn to manipulate without it. The ingenious erecting prism of Nachet may be used, which does not in the least injure the definition. In this case the upright stand of Nachet will be found very steady and convenient.—The upright position of the continental stand, with its short tube and low stage, is better adapted for real work, in dissection and in mounting objects, than the more elaborate English and American instruments; while the latter are superior for the resolution of test objects and for the study of tissues already prepared and mounted under the low vertical instrument.—Lieberkühns are polished silver specula fitted to the lower powers, the polished surface being presented to the object; they are used in conjunction with what are termed dark wells, which consist of a slender rod carrying at the summit a blackened cap of brass, and are placed directly under the object so as to cut off the direct light; where the object itself is mounted on an opaque background, they are unnecessary. The light reflected from the mirror below, falling upon the Lieberkühn, is condensed upon the object. There are many opaque objects which cannot be well seen without this kind of illumination, and it is justly considered a very important addition to the apparatus.—The frog plate is a flat mahogany or metal plate, having a slightly elevated glass platform, and the edge of the plate pierced with holes or furnished with split pins. By means of threads tied to the toes of the frog, the web may be spread

out on the plate, the body of the frog being enclosed in a bag and strapped to the plate; care must be taken not to draw the string too tightly around the mouth of the bag where the leg protrudes, as it stops the circulation. The bag may be dispensed with by holding the frog a moment or two in water of 120° F., when it becomes perfectly rigid and apparently insensible. In this condition it may be opened, and the circulation of the blood in the veins and arteries of the mesentery most beautifully exhibited; care must be taken to keep the parts moist. For minute dissection we have found the eye instruments exceedingly useful. Fine scissors and forceps are made for this purpose, of most excellent quality, by Charrière of Paris.—In working with the monocular microscope, one should acquire the habit of keeping both eyes open. If the eyes are allowed to rest easy, and then the focus carefully adjusted to suit while thus resting, no great fatigue will be experienced in using the microscope; if, however, the focus is only approximated, and then distinct vision obtained by forcing the eye, severe pain and headache will ensue. The writer has worked with a bright light for six or eight hours, with but slight intermission, without fatigue. Long experience and great caution are requisite in interpreting the phenomena revealed by the microscope, and one soon learns that things are not always what they seem. This, however, cannot be justly urged against its use. When directed by skilful hands, and guided by experience, its revelations are of the most exalted and truthful character. No one can hope to succeed in the department of natural history who is not a skilful microscopist. A north light, coming from the left hand, the stage movements being at the right hand, is the best light for day. At night, the naphtha or coal oil lamp, as now made by Beck, gives the most intense and steady flame. The gas jet is difficult to manage for delicate work.—A simple and very effective arrangement for illumination is that used by Dr. Edward Curtis of New York: "A small petroleum lamp is placed in a cigar box, which stands on one of its ends. On one side of the box is cut a small aperture, in which is placed a piece of blue glass, to soften the light as it passes to the microscope mirror. Another larger opening is made in the front of the box, and is occupied by three different glasses. The one nearest the lamp is a square piece of ground glass; the next one is also square and flat, but colored blue. Finally, a plano-convex lens of long focus is placed at such an inclination as to condense the rays of light, thus softened, on to the work-table for use in dissecting or in arranging preparations."—Many of the "test objects" have been so long known that it seems almost unnecessary to mention them. The markings on the silicious shells of diatoms have been highly recommended. As general tests, they are no doubt very serviceable, but they are not en-

tirely to be relied upon unless the same specimen is used in comparisons, on the same stand, and with the same illumination. In the following table the usual tests, both for direct and oblique illumination, are given:

Objective, inches.	Angle of aperture.	Direct light.	Oblique light.
2 or $1\frac{1}{2}$	20°	Sections of echinus. " of wood.	.....
1	28°	Pollen grains, &c.	<i>Pinnularia viridis</i> .
$\frac{1}{2}$	33°	Tracheæ of insects.	<i>Cocconeia lanceolatum</i> .
$\frac{1}{3}$	80°	<i>Pleurosigma attenuatum</i> .	<i>Pleurosigma fasciola</i> .
$\frac{1}{4}$	100°	<i>Pleurosigma strigosum</i> .	<i>Hyalodiscus Callifornicus</i> .
$\frac{1}{5}$	140°	<i>Pleurosigma fasciola</i> .	<i>Navicula rhomboides</i> .
$\frac{1}{12}$ or $\frac{1}{16}$	170°	Do. do.	<i>Grammatophora subtilissima</i> of Providence.

The following table exhibits the lineation of different species of *diatomaceæ* which have been employed as tests; the measurements are those of Messrs. Sullivan and Wormley:

	Tests.	Striae in 1-1000 of an inch.
1.....	<i>Pleurosigma formosum</i> .	36 diag.
2.....	" <i>strigile</i> .	80 trans.
3.....	" <i>Balticum</i> .	36 "
4.....	" <i>attenuatum</i> .	36 "
5.....	" <i>hippocampus</i> .	35 "
6.....	" <i>strigosum</i> .	42 diag.
7.....	" <i>quadratum</i> .	45 "
8.....	" <i>elongatum</i> .	48 "
9.....	" <i>laeustre</i> .	42 trans.
10.....	" <i>angulatum</i> .	50 diag.
11.....	" <i>fasciola</i> .	56 trans.
12.....	<i>Navicula rhomboides</i> .	70 "
13.....	<i>Nitzschia sigmoidea</i> .	70 "
14.....	<i>Collettonema vulgare</i> .	72 "
15.....	<i>Grammatophora subtilissima</i> , Greenport.	70 to 75 trans.
	Do. do. Providence.	75 to 80 "
16.....	<i>Synedra capitata</i> , hoop of.	said to be 75 "
17.....	<i>Amphipleura pellucida</i> .	130 "

J. D. Möller of Wedel, in Holstein, who is well known for his beautiful mountings, furnishes a plate on which are mounted, in a line, the following 20 diatoms, in the order designated by Dr. Grunow: 1, *triceratium fuvus*; 2, *pinnularia nobilis*; 3, *navicula lyra*, var.; 4, *navicula lyra*; 5, *pinnularia interrupta*, var.; 6, *Stauroneis phænicerteron*; 7, *grammatophora marina* (more coarsely marked than Bourgoynes variety); 8, *pleurosigma Balticum*; 9, *pleurosigma acuminatum*; 10, *Nitzschia amphioxys*; 11, *pleurosigma angulatum*; 12, *grammatophora oceanica subtilissima* (marina); 13, *surirella gemma*; 14, *Nitzschia sigmoidea*; 15, *pleurosigma fasciola*, var.; 16, *surirella gemma* (longitudinal lines and beads); 17, *cymatopleura elliptica*; 18, *navicula crassineris*, *frustulia Saxonica*; 19, *Nitzschia curvula*; 20, *amphipleura pellucida*. Dr. Woodward has photographed *surirella gemma*, and has obtained the longitudinal striæ as "rows of minute hemispherical bosses. The fine transverse striæ counted longitudinally at the rate of 72 to the $\frac{1}{1000}$ of an inch. Transversely

these lines were resolved into beaded appearances, which counted laterally 84 to the $\frac{1}{1000}$ of an inch." ("American Journal of Science," May, 1871.) But all organic markings are variable as to dimensions and visibility, and hence are not comparable except when one and the same object is used in the comparison of the efficiency of two lenses. Mr. Nobert has succeeded in giving comparable test objects to microscopists by ruling on glass plates bands of parallel lines, the distances between the lines of successive bands constantly decreasing. His most recent plate contains 19 bands. The distance between the lines in the first band is $\frac{1}{1500}$ of a Paris line, and increases by $\frac{1}{300}$ in each to the 19th, in which it is $\frac{1}{1000}$. The lines in the higher orders of bands are as close together as those of the diatoms whose markings are difficult to resolve. M. Schultze resolved the 15th band, and subsequently Dr. H. Frey resolved the 17th, with a Hartnack immersion No. 11. In 1869 Dr. Woodward resolved the 18th and 19th bands with an immersion $\frac{1}{16}$ of Powell and Lealand, and Dr. Edward Curtis photographed them. Dr. Woodward says ("American Journal of Science," September, 1869): "The photograph of Dr. Curtis was taken without an eye piece and with such a distance that the immersion $\frac{1}{16}$ gave 1,000 diameters. The illumination was by sunlight passed through the ammonio-sulphate of copper, a $\frac{1}{4}$ objective of 148° angle of aperture being used as the condenser, without diaphragm or stop, and obliquity of light obtained by means of the centring screws of the second-order stage. . . . Returning now to this immersion $\frac{1}{16}$, it may be remarked that the work just done with it has an important bearing on the question of the real limits of microscopic vision. Nobert, in sending me the plate above described, wrote me that in his opinion the 15th band was the limit of possible microscopic vision. He based his opinion upon Fraunhofer's formula with regard to the spectra of gratings, and upon the known wave length of light undulations. Dr. Barnard of Columbia college, New York, after reading Nobert's letter, writes me that in his opinion Fraunhofer's formula does not apply to the visibility of fine lines when observed with a modern microscope of high power, since the great angle of aperture of the objective permits oblique rays to reach the eye, and Fraunhofer's formula applies only when the eye is perpendicular to the grating. Dr. Barnard is therefore of the opinion that the limit suggested by Nobert has no real existence. In his letter, which I should mention was written before he was aware that I had satisfactorily resolved any of the bands beyond the 15th, he proposed that a trial should be made, to resolve the test plate with monochromatic light, of colors longer than the violet which I had been using. Accordingly, obtaining monochromatic light by a prism on which a ray of sunlight was thrown, I succeeded after some trials in satisfactorily resolving the 19th

band with each of the colors of the spectrum, from the violet to the red. It may therefore be concluded that the present limit to microscopic vision is simply the goodness of the objective; and the rapidity of recent improvements may well lead us to hope for a still further advance." Subsequently Nobert ruled, for the scrutiny of Drs. Barnard and Woodward, lines approximated even closer than the 19th band, but the test has exceeded as yet the resolving power of their lenses. In judging of the merits of an objective, it appears to us that oblique illumination has been too much dwelt upon. The angle of aperture having been ascertained, the general merits will be much more apparent by use of tests, Nobert's lines for example, with the best central illumination. If the scale of *podura plumbea* is employed, select a medium-sized rather than a large one. The wedge-shaped dots should be sharply defined, without fog or mist. The scales of the American *podura* are not dotted but lined, and are not so suitable.—See Quekett "On the Use of the Microscope" (London, 1848; last ed., 1865); Robin, *Du microscope* (Paris, 1849); Harting, *Het Mikroskoop* (Utrecht, 1852; translated into German by Dr. Theile, Brunswick, 1859); Wythes, "The Microscopist" (Philadelphia, 1853); Schacht, "The Microscope," edited by Currey (London, 1855); Griffith and Henfrey, "Micrographic Dictionary: Introduction" (London, 1856); Gosse, "Evenings at the Microscope" (London and New York, 1859); West, "Half Hours at the Microscope" (London, 1859); Beale, "Application of the Microscope to Clinical Medicine" (2d ed., London, 1859); Clarke, "Objects for the Microscope" (London, 1859); Hogg, "The Microscope" (London, 1867); Beale, "How to work with the Microscope" (London, 1868); Carpenter, "On the Microscope, its Revelations, and its Uses" (London and Philadelphia, 1868); Woodward, "Photo-micrography," in the "American Journal of Science," vols. xlix. and l.; F. A. P. Barnard, "Microscopes," in his "Report on the Apparatus of the Exact Sciences exhibited in the Paris Exposition, 1867;" H. Frey, "The Microscope and Microscopical Technology," translated from the German and edited by George Cutter, M. D. (New York, 1872); "Transactions of the Microscopical Society of London;" and "Quarterly Journal of Microscopical Science" (London).

MICROSCOPIC ANIMALS. See ANIMALCULES.

MICROSTHENES. See MEGASTHENES.

MIDAS, the name of several mythical kings of Phrygia. Rawlinson remarks in a note to Herodotus: "In the royal house of Phrygia, the names Midas and Gordius seem to have alternated perpetually, as in that of Cyrene the names Battus and Arcesilaus. Every Phrygian king mentioned in ancient history is either Midas, son of Gordius, or Gordius, son of Midas. Bouthier reckons four kings of Phrygia named Midas, each the son of a Gordius. Three of these are mentioned in Herod-

otus." Duncker, in *Geschichte des Alterthums* (4th ed., Leipsic, 1874), places the reign of the first Midas in the middle of the 8th century B. C., and supposes the dynasty to have become extinct in the 6th, with the successors of the third Midas, King Gordius and his son Adrastus. The following is the principal myth connected with the name of Midas. Midas conferred a favor on Bacchus, and the god desired him to ask whatsoever he pleased. Midas requested that everything touched by him might become gold. The request was granted, but as his food underwent the metamorphosis as well as all things else, he was reduced to a state of starvation, and implored the god to recall his grant. Bacchus bade him bathe in the Pactolus; and Midas having done so, instantly his touch lost its auriferous power in the case of all things essential to life, while the sands of the river were converted into gold. Midas was once chosen umpire in a musical contest between Pan and Apollo; he awarded the palm to Pan, in revenge for which Apollo changed his ears into those of an ass. Midas, to hide this deformity, used to wear a lobed cap; but the slave whose business it was to cut his hair became privy to the secret, which so troubled him that, afraid to reveal it to a fellow mortal, and unable to keep it to himself, he dug a hole in the earth, and whispered into it: "King Midas has asses' ears." He then filled up the hole, but a reed sprung up on the spot, which, as often as the wind blew, whispered his words to the world. Midas is said to have killed himself by drinking the blood of an ox.

MIDDELBURG, a town of Holland, capital of the province of Zealand, situated near the centre of the island of Walcheren, 82 m. S. W. of Amsterdam; pop. in 1871, 16,580. The town is circular, and surrounded by a ditch and a bastioned mound, the top of which forms a favorite public promenade. It has a gymnasium, an academy of design, a clinical school, a theatre, and various manufactures. The town hall was built by Charles the Bold in 1468, and is ornamented with 25 colossal statues of counts and countesses of Flanders. The town was founded in 1132, belonged for some time to the Hansa, and was taken by the Dutch from the Spaniards in 1574. The British lost 7,000 men here from the effects of the climate during the famous Walcheren expedition in 1809.

MIDDLE AGES. See AGES.

MIDDLEBURY, a town and the capital of Addison co., Vermont, on Otter creek at Middlebury falls, and on the Rutland division of the Central Vermont railroad, 35 m. S. of Burlington, and 33 m. S. W. of Montpelier; pop. in 1870, 3,086. It is surrounded by attractive mountain scenery. Fine white and variegated marble is found here, and large quantities are quarried and exported. The town contains a cotton factory, a woollen factory, an iron foundry, a national bank, a weekly newspaper, 14 public schools, including a high school, and five churches. It is the seat of Middle-

bury college, under the control of the Congregationalists, opened in 1800. It occupies three large buildings, and in 1873-'4 had 8 professors, 52 students, a cabinet of zoölogy, botany, and mineralogy, and a library of 11,000 volumes.

MIDDLESBOROUGH, a town of Yorkshire, England, in the North riding, on the Tees, 3½ m. from its mouth and 29 m. S. S. E. of Newcastle-on-Tyne; pop. in 1871, 39,585. The population of the township in 1821 was only 40; in 1831, 154; in 1841, 4,500; in 1851, 7,431. The rapid increase is attributable to the rise of the coal trade, consequent on the opening of the Stockton and Darlington railway, from the collieries of south Durham. The town was regularly and substantially built by a joint-stock company, as a port for loading colliers. In 1873 it had 31 places of worship. There is also a national school, and an observatory. The number of vessels entering the port in 1871 was 1,278, tonnage 247,927; cleared 1,407, tonnage 288,952. There are important manufactories of sail cloth and rope, an extensive pottery, iron works, and ship yards.

MIDDLESEX. I. A N. E. county of Massachusetts, bordering on New Hampshire, bounded S. E. by the Charles river and drained by the Merrimack, Nashua, and Concord rivers, and other streams; area, 888 sq. m.; pop. in 1870, 274,353. The immense water power supplied by a number of streams is largely employed in manufactures. Several railroads intersect the county. The chief productions in 1870 were 20,350 bushels of rye, 190,965 of Indian corn, 56,302 of oats, 14,880 of barley, 443,099 of potatoes, 520,136 lbs. of butter, and 74,678 tons of hay. There were on farms 5,836 horses, 16,887 milch cows, 2,107 working oxen, 7,260 other cattle, 983 sheep, and 8,104 swine. The total number of manufacturing establishments was 1,878, employing \$43,528,466 capital, and having an annual product of \$113,147,270. The chief establishments were 7 for bleaching and dyeing, 154 manufactories of boots and shoes, 15 of boot and shoe findings, 2 of carpets, 54 of men's clothing, 20 of cotton goods, 6 of drugs and chemicals, 21 of flouring mill products, 50 of furniture, 5 of glassware, 15 of hardware, 7 of hosiery, 5 of India-rubber and elastic goods, 21 of iron in various forms, 70 of leather, 3 of liquors, 48 of lumber, 52 of machinery, 25 of soap and candles, 6 of straw goods, 55 of tin, copper, and sheet-iron ware, 1 of watches, 22 of woollen goods, 12 of worsted goods, and 4 cotton and woollen print works. Capitals, Cambridge and Lowell. **II.** A S. county of Connecticut, bordering on Long Island sound and intersected by the Connecticut river, which also forms a part of the E. boundary; area, about 430 sq. m.; pop. in 1870, 35,722. The surface is somewhat uneven, and the soil generally fertile. Several streams furnish water power. The New Haven and New London railroad passes through the S. part. The chief productions in 1870 were 5,841 bushels of wheat, 17,101 of rye, 85,451 of Indian

corn, 40,352 of oats, 176,231 of potatoes, 609,327 lbs. of tobacco, 13,644 of wool, 404,620 of butter, 39,882 tons of hay, and 2,035 gallons of sorghum molasses. There were 1,888 horses, 5,031 milch cows, 3,938 working oxen, 5,502 other cattle, 4,735 sheep, and 2,869 swine. In 1870 the county contained 429 manufacturing establishments, employing 4,503 hands, and having a capital of \$4,614,630, and an annual product of \$7,719,537. The principal manufactories were 2 of agricultural implements, 10 of bells, 10 of men's clothing, 17 of cotton goods, 2 of edge tools and axes, 28 of hardware, 3 of hooks and eyes, 9 of iron castings, 4 of turned ivory, 2 of musical instruments, 3 of printing paper, 8 of plated ware, 1 of pumps, 2 of sewing machines, 12 of tin, copper, and sheet-iron ware, 1 of washing machines, 4 ship yards, 11 flour mills, and 13 saw mills. Capitals, Middletown and Haddam. **III.** A central county of New Jersey, intersected by the Raritan river and bounded E. by Raritan bay and Staten Island sound; area, 399 sq. m.; pop. in 1870, 45,029. The surface is level toward the S. E. and undulating in the N. and N. E.; and the soil, which varies from a light sand to a deep clay, is generally fertile. It is intersected by the Camden and Amboy, the New Jersey, and the Freehold and Jamesburg railroads. The chief productions in 1870 were 106,158 bushels of wheat, 15,967 of rye, 423,843 of Indian corn, 271,332 of oats, 248,830 of Irish and 12,391 of sweet potatoes, 418,434 lbs. of butter, and 37,160 tons of hay. There were 4,888 horses, 6,135 milch cows, 3,728 other cattle, 3,449 sheep, and 6,453 swine; 32 manufactories of brick, 1 of freight and passenger cars, 1 of drugs and chemicals, 3 of India-rubber and elastic goods, 2 of iron castings, 1 of paper hangings, 3 of sash, doors, and blinds, 2 of stone and earthen ware, 12 flour mills, 4 saw mills, 5 tanneries, 8 distilleries, 4 ship yards, and 1 cork-cutting establishment. Capital, New Brunswick. **IV.** An E. county of Virginia, bordering on Chesapeake bay, at the mouth of the Rappahannock river, which forms its N. E. boundary, and bounded S. W. by the Pianco-tank river; area, 170 sq. m.; pop. in 1870, 4,981, of whom 2,522 were colored. The chief productions in 1870 were 19,650 bushels of wheat, 86,967 of Indian corn, 11,420 of oats, and 13,754 lbs. of butter. There were 426 horses, 777 milch cows, 1,189 other cattle, 1,277 sheep, and 2,810 swine. Capital, Saluda.

MIDDLESEX, a S. W. county of Ontario, Canada, watered by the Thames, Aux Sables, and Sydenham rivers; area, 1,228 sq. m.; pop. in 1871, 82,595, of whom 28,464 were of English, 26,569 of Irish, 20,354 of Scotch, 2,888 of German, and 1,075 of Dutch origin, and 1,278 were Indians. It is traversed by the Grand Trunk, the Great Western, and the London and Port Stanley railways. Capital, London.

MIDDLESEX, a S. E. county of England, bordering on Hertfordshire, Essex, Kent, Surrey, and Buckinghamshire; area, 283 sq. m.;

pop. in 1871, 2,538,882. It is the smallest county in the kingdom except Rutland, but the greatest in population, wealth, and importance, as it comprises the greater part of London, which occupies 51 sq. m. of the county. Much of the land is devoted to market gardening, though more of it is in meadow and pasture. The chief towns, besides London, are Brentford, the capital, Hounslow, and Uxbridge.

MIDDLE THIBET. See LADAKH.

MIDDLETON, the name of a family noted in the history of South Carolina. **I. Edward**, its founder, was a native of Twickenham, England, where he inherited a large property. He removed to South Carolina, and was a member of the council under the lords proprietors in 1680, 10 years after its settlement. He evinced decided republican tendencies, and maintained popular rights in opposition to the government. **II. Arthur**, son of the preceding, was a member of the council in 1712. His influence was exerted in favor of popular claims, opposing the close borough system of the lords proprietors, and finally he headed the revolution which threw off the proprietary government and placed the colony under the immediate protection of the crown (1719). He was governor of the colony from 1725 to 1731, after which he remained in the royal council.

III. Henry, son of the preceding, was an aged man at the outbreak of the revolution, but was sent as a delegate from South Carolina to congress, of which body he was president in 1775.

IV. Arthur, son of the preceding, born at the family seat on Ashley river in 1743, died Jan. 1, 1787. He was educated at Harrow and Westminster schools, and the university of Cambridge, and became a revolutionary leader. He was one of the most efficient members of the first council of safety. In 1776 he was sent as a delegate of the state to congress, and as such affixed his signature to the Declaration of Independence. He held his seat in congress till 1777, declined the governorship of South Carolina in 1778, took the field for the defence of Charleston in 1779, saw his plantation devastated by the British, was made a prisoner after the fall of Charleston in 1780, and was one of the leading citizens who were confined as hostages. His estate was sequestered, and he was confined in the castle of St. Augustine, and afterward in the Jersey prison ship. Exchanged in the latter part of 1780, he served till the close of the war as a delegate in congress, and was afterward elected to the state senate. He was a stenographer, and took down many of the debates in which he participated. He wrote effective political essays under the signature of "Andrew Marvell."

V. Henry, son of the preceding, born in 1771, died in Charleston, June 14, 1846. He was a member of the state legislature from 1801 to 1810; was governor of the state in 1810-'12; a representative in congress from 1815 to 1819; and in 1820 was appointed minister to Russia, which post he held till 1831.

MIDDLETON, Conyers, an English clergyman, born in Richmond, Yorkshire, Dec. 27, 1683, died at Hildersham, Cambridgeshire, July 28, 1750. He graduated at Trinity college, Cambridge, in 1702, was ordained deacon, was elected a fellow of his college in 1706, and in 1708 signed the petition against Bentley, the master. This was the beginning of a controversy between them, long continued in the university and in the courts, Middleton being twice convicted of libel. The office of principal librarian of the university was created for him. In 1726 Middleton published an attack upon the medical profession, entitled *De Medicorum apud Veteres Romanos degentium Conditione Dissertatio*. In 1729 appeared his "Letter from Rome" (which he had visited in 1724), in which he attempted to show that "the religion of the present Romans was derived from their heathen ancestors." He also attacked the miracles of the Roman Catholic church in a way which awakened a suspicion of his disbelief in the miracles of the New Testament. A letter to Dr. Waterland published in 1731 gave still more serious offence to the clergy, and Middleton found it necessary to publicly avow his belief in Christianity. In 1735 he published "A Dissertation concerning the Origin of Printing in England," and in 1741 his most popular work, "The History of the Life of M. Tullius Cicero" (2 vols., London), from the profits of which he purchased a small estate at Hildersham, 6 m. from Cambridge, where he passed the rest of his days. The "History" was followed by a translation of the correspondence of Cicero and Brutus, together with a defence of its authenticity (1743), and a "Free Inquiry into the Miraculous Powers which are supposed to have subsisted in the Christian Church from the Earliest Ages" (1749), which exposed him again to the charge of infidelity. In 1750 appeared his "Examination of the Bishop of London's [Dr. Sherlock's] Discourses concerning the Use and Intent of Prophecy." His works, with the exception of the "Life of Cicero," were collected and published in 1752, in 4 vols. 4to, and subsequently in 5 vols. 8vo.

MIDDLETON, Thomas, an English dramatist, born in the latter part of the 16th century, died in July, 1627. In 1620 he was appointed chronologer or city poet of London. He was associated with Jonson, Fletcher, Massinger, and Rowley in the composition of several plays. "A Mad World, my Masters," "The Mayor of Queenborough," and "The Roaring Girl," are in Dodsley's collection. His "Game at Chess," performed in 1624, gave umbrage to the court on account of its allusions to the king and ambassador of Spain, and Middleton and the players were brought before the privy council and censured for their audacity in "bringing modern Christian kings upon the stage." From his play called "The Witch" Shakespeare has been supposed to have borrowed the witch incantations in "Macbeth."

MIDDLETON, Thomas Fanshawe, an English scholar, born at Kedleston, Derbyshire, Jan. 26, 1769, died in Calcutta, July 8, 1822. He was educated at Christ's hospital, London, and Pembroke hall, Cambridge, took orders, and while curate of Gainsborough in 1792 he edited a periodical called the "Country Spectator." His principal work is "The Doctrine of the Greek Article applied to the Criticism and Illustration of the New Testament" (London, 1808). He was prebendary of Lincoln in 1809, archdeacon of Huntingdon in 1812, and consecrated as first bishop of Calcutta, May 8, 1814. His sermons, charges, and tracts were collected and published with a life by Dr. Henry Kaye Bonney (London, 1824), and his life was also written by the Rev. Charles Webb Le Bas (2 vols. 8vo, London, 1830).

MIDDLETOWN, a city, port of entry, and one of the shire towns of Middlesex co., Connecticut, on the right bank of the Connecticut river, 30 m. above its mouth, 24 m. N. E. of New Haven, and 15 m. S. of Hartford; pop. of the city in 1870, 6,923, exclusive of 4,203 in the town. It is situated at the intersection of a branch of the New York, New Haven, and Hartford railroad with the Connecticut Valley and the New Haven, Middletown, and Willimantic lines. The city has a gradual ascent from the river, with which the principal streets run parallel, crossed at right angles by others; it is well built, chiefly of brick, and has many fine situations and elegant mansions in the environs. It has a custom house built of Portland freestone, and a court house. The wharves have 10 ft. of water, and can accommodate such vessels as can cross the bar. During the year ending June 30, 1873, there were 229 entrances, tonnage 231,675, and 7 clearances, tonnage 720, all coastwise. There were belonging in the district 115 sailing vessels of 11,008 tons, 25 steamers of 5,815 tons, and 7 barges of 1,234 tons. There are four national banks, with an aggregate capital of \$969,300, two savings banks with more than \$8,000,000 of deposits, and important manufactures, embracing cottons, foundry products, britannia ware, hardware, silver-plated ware, rules, chisels, sewing machines, pumps, webbing, tape, guns, screws, leather, &c. The city has a daily and two weekly newspapers, and a bi-weekly, a high school and six other public schools, and 15 churches. It is the seat of the insane asylum, the state industrial school for girls, Wesleyan university (see **WESLEYAN UNIVERSITY**), and Berkeley divinity school (Episcopalian). The last named institution was established in 1854, and in 1873-'4 had 5 professors, 34 students, and a library of 14,000 volumes.

MIDDLETOWN, a village of Orange co., New York, at the intersection of the Erie, the New York and Oswego Midland, and the New Jersey Midland railroads, 21 m. W. by S. of Newburgh, and 55 m. N. N. W. of New York; pop. in 1870, 6,049. It is in the midst of a wide undulating plain, partly between and partly upon

several gradually sloping hills. The view to the north and south is unbroken, while on the west it is bounded by the Shawangunk mountains and on the east by the Highlands along the Hudson and the mountains beyond. In the S. W. part of the village is Hillside cemetery, containing 50 acres, handsomely laid out and adorned. The streets are broad, clean, well shaded, sewer, lighted with gas, and bordered with flagged sidewalks. Water is supplied from a reservoir of 80 acres, 2 m. from the village, elevated from 100 to 200 ft. above its level. It has a fire department, a police force, and a board of health. There are many substantial business blocks, a fine masonic hall, neat cottages, and handsome residences. The state homeopathic asylum for the insane occupies a building capable of accommodating from 80 to 100 patients, with a wing in course of construction (1874) designed to accommodate 175 more. Middletown is surrounded by a rich dairy and stock-raising district, from which it derives a large and profitable trade. It has manufactories of saws, files, hats, furnaces, carpet bags, agricultural implements, lawn mowers, gloves, blankets, patent medicines, flavoring extracts, &c. There are several hotels, an opera house seating 1,000 persons, public halls, two national banks, a savings bank, five brick school houses with a system of graded schools, a female seminary, several private schools, a library and reading room, a daily and three weekly newspapers, and nine churches.

MIDGE, a small fly. See **DIPTERA**.

MIDIANITES, a nomad or half-nomad people of northern Arabia, who in the time of the early history of the Hebrews dwelt in the vicinity of the Arabian gulf and Dead sea, especially between Mt. Sinai and Moab. They are derived in Scripture from Midian, the son of Abraham by Keturah, and appear occasionally as merchants, and more frequently, like Bedouins, making raids into the neighboring territories of the Hebrews. Moses, who was himself the son-in-law of a Midianite priest, Jethro, waged a war of extermination against those of their tribes who in conjunction with the Moabites had enticed the Hebrews to idolatry when they were approaching Canaan. Gideon seems to have broken their power by his great victory over them and their allies the Amalekites. Some critics, to remove difficulties arising from apparently contradictory Scriptural statements, distinguish between Abrahamite and Cushite tribes of the same name, the former of whom, descendants of the same Semitic stock, lived in hostility to the Hebrews, while the daughter of Jethro is identified with the Cushite wife of Moses, mentioned in another part of his history (Num. xii. 1).

MIDLAND, an E. central county of the southern peninsula of Michigan, intersected by Tittabawassee river and drained by its branches, the Chippewa, Salt, and Pine rivers; area, 550 sq. m.; pop. in 1870, 3,285. The surface is

level and the soil fertile. The Flint and Père Marquette railroad passes through it. The chief productions in 1870 were 3,640 bushels of wheat, 6,838 of rye, 11,224 of oats, 23,408 of potatoes, 31,175 lbs. of butter, and 2,498 tons of hay. There were 257 horses, 315 milch cows, 409 other cattle, 298 sheep, and 254 swine. Capital, Midland.

MIDLOTHIAN. See EDINBURGSHIRE.

MIDSHIPMAN, the lowest grade of officers in the line of promotion in the naval service. The number of midshipmen in the United States navy in 1874 was about 100, and no one can be appointed unless he is a graduate of the naval academy at Annapolis. The members of this institution are denominated "cadet midshipmen," and the appointments are distributed by law among the states and territories which have not their relative proportion on the navy list; and it is further required that the appointments from each state shall be apportioned as nearly as practicable equally among the several congressional districts therein; that the person appointed shall be an actual resident of the congressional district from which he is appointed, and be recommended by the member of congress for that district. Since the revival of the apprentice system in 1864, 10 apprentices from the school ships are annually eligible by competitive examination to appointments in the naval academy, and of late several of the congressional appointments have been made from the apprentices. Candidates must be over 15 and under 18 years of age at the time of the examination for admission; must be free from deformity, disease, or imperfection of the senses; must be of good moral character, able to read and write well, writing from dictation and spelling with correctness, and to perform with accuracy the various operations of the ground rules of arithmetic. The examinations to which they are subjected are, first, by a board of three surgeons, and then by one of professors. If found qualified, they become members of the academy; their actual travelling expenses from their place of residence to the institution are paid by the government, and they are placed upon a pay of \$500 per annum. The course of instruction at the naval academy, which now embraces a period of six years, includes mathematics, astronomy, navigation and surveying, ethics and English studies, natural and experimental philosophy, French and Spanish, drawing, artillery and infantry tactics, practical seamanship, naval gunnery both theoretical and practical, the steam engine, &c. During the academic course two cruises of about three months each are made in a ship of war for instruction. Warrants as midshipmen are conferred upon the graduates of the academy, who take rank in the order of merit. By the act of March 3, 1865, when on sea duty they receive pay at the rate of \$800 a year. After two years of actual sea service, midshipmen, if they produce a favorable testimonial from their com-

manders, are entitled to a final examination for promotion, which is made by a board composed of three captains and two commanders. This examination is on the practical branches of the profession, and includes seamanship and naval tactics, practical navigation, gunnery, and the steam engine. Having passed this, they receive new warrants as ensigns, with increased pay; and promotion to the higher grades of the service is open to them.—In the British navy, young gentlemen intended for commissioned officers are educated, in the first instance, at the royal naval college; and afterward, while serving at sea, and until their promotion to a higher grade than midshipman, they are obliged to devote a portion of their time to study under a competent instructor. They begin actual service as naval cadets, proceed as midshipman, and after 5½ years of service, if they pass a proper examination in seamanship and navigation, and are 19 years of age, they are promoted to lieutenants. They are considered as the principal petty officers, rank comparatively with ensigns in the army, and their pay is £84 4s. a year. In smaller vessels some of the senior midshipmen are intrusted with the watch; they take charge of boats and small parties of men going ashore, pass the word of command, and see that the orders of their superiors are carried into effect. A midshipman's share of prize money is the same as that of a petty officer, a cadet's equal to that of the captains of the tops; and both receive the rations of seamen, but may provide a mess at their own expense.—The French *aspirants de marine* perform similar duties to those of midshipmen. They are of two classes, are especially educated for their profession at the naval academy in Brest, and undergo a strict examination before receiving their appointment afloat, where they serve from the age of 12 to 20 years. They are not entitled to command a ship till they have attained the age of 21.

MIDWIFERY. See OBSTETRICS.

MIEL, or **Meel, Jan**, called by the Italians Giovanni della Vite, a Flemish artist, born near Antwerp in 1599, died in Turin in 1664. He was employed in decorating the Vatican, became a member of the Roman academy, and was appointed first painter to the court of Savoy. His easel pictures of fairs, carnivals, hunting parties, market scenes, gypsies, &c., are his best works. He etched several plates from his own designs. Some of his best pictures are in the imperial gallery in Vienna.

MIERIS. **I. Frans**, the elder, a Dutch painter, born in 1635, died in Leyden in 1681. He was a pupil of Gerard Douw, and painted genre pictures and occasionally portraits, all remarkable for delicacy of finish, accuracy of drawing, and correctness of design. His pictures are not numerous, and bring very large sums. He died a prisoner for debt, in consequence of an extravagant course of life. **II. Willem**, son of the preceding, born in Leyden in 1662, died there, Jan. 24, 1747. He was the pupil of his

father, and equalled him perhaps in delicacy of finish, though he was inferior in color, drawing, and design. He attempted historical subjects in combination with landscape, and his picture of "Rinaldo asleep on the lap of Armida" was repeated by him in several copies. His domestic subjects are held in high estimation.

III. Frans, the younger, son of the preceding, born in Leyden, Dec. 24, 1689, died there, Oct. 22, 1763. He studied painting with his father, and executed similar subjects, although in a much inferior manner. He also made numerous copies of the works of his father and grandfather, which frequently pass for originals with inexperienced purchasers. He was an industrious student of history, and wrote several works relating to the Low Countries, including *Historie der nederlandsche vorsten* (3 vols. fol., the Hague, 1732-'5), and *Groot charterboek der graven van Holland, Zeeland en Vriesland* (4 vols., Leipsic, 1753-'6). He was engaged upon a history of Leyden at his death.

MIEROSLAWSKI, Ludwik, a Polish revolutionist, born at Nemours, France, in 1814. He is the son of a Polish officer in the French service, and was educated at the military school in Kalisz. He joined the revolutionists in 1830, served with distinction in the campaigns of the following year, and after the fall of Warsaw removed to Paris. He published various books in Polish and French, and among others a critical military history of the Polish revolution. He was selected by the democratic organization of the Poles at Paris as principal leader for the next rising of Poland. This failed, however (1846), and Mieroslawski was arrested, tried at Berlin, and imprisoned under sentence of death. The Berlin revolution of March, 1848, opened his prison, and he immediately hastened to the duchy of Posen, and armed for another Polish rising. A bloody conflict was the result. The Poles gained a signal victory at Miloslaw; but after some reverses Mieroslawski resigned his command, and the insurgents were disarmed (May). Early in 1849 he was summoned to Sicily to take command of the revolutionary forces; but after being wounded in the defence of Catania (March), he resigned his post. Once more he took command of a revolutionary army in Baden, but after a few encounters with the Prussians he was obliged to retire to the fortress of Rastadt, which surrendered soon after (July), and he returned to Paris. He took a brief part in the Polish insurrection of 1863, his command being disastrously defeated at Rziejewo on Feb. 22. He again returned to France, where he has since published several works on the political dissensions among the Polish emigrants.

MIFFLIN, a central county of Pennsylvania, intersected by the Juniata river; area, 375 sq. m.; pop. in 1870, 17,508. It is traversed by several high mountain ranges; the valleys are fertile. The Pennsylvania canal and the Pennsylvania railroad, with its Lewistown division and

Mifflin and Centre county branch, pass through it. The chief productions in 1870 were 322,835 bushels of wheat, 365,806 of Indian corn, 322,487 of oats, 73,211 of potatoes, 20,457 lbs. of wool, 415,115 of butter, and 15,005 tons of hay. There were 4,373 horses, 3,908 milch cows, 4,944 other cattle, 7,552 sheep, and 8,449 swine; 10 manufactories of clothing, 1 of edge tools and axes, 2 of pig iron, 3 of iron castings, 1 of engines and boilers, 9 of saddlery and harness, 4 of woollen goods, 6 flour mills, 4 saw mills, and 11 tanneries. Capital, Lewistown.

MIFFLIN, Thomas, an American revolutionary general, born in Philadelphia in 1744, died in Lancaster, Pa., Jan. 20, 1800. He was by birth and education a Quaker, entered public life in 1772 as a representative from Philadelphia in the colonial assembly, and in 1774 was a delegate to the first continental congress. In June, 1775, he accompanied Washington to Cambridge as his first aide-de-camp, with the rank of colonel. Subsequently he was adjutant general, and in the spring of 1776 was commissioned as a brigadier general. He distinguished himself in the battle of Long Island, and in the latter part of 1776 raised considerable reinforcements in Pennsylvania for Washington's army. In 1777 he was made a major general, and became an active member of the "Conway cabal." The project of making Gates commander-in-chief failing, he resigned his commission, and in 1783 was elected to congress, of which he became president at the close of the year. In 1785 he was speaker of the Pennsylvania legislature, and in 1787 a member of the convention which framed the federal constitution. In October, 1788, he succeeded Franklin as president of the supreme executive council of Pennsylvania; and in 1790 he was chosen governor of Pennsylvania, which office he held till shortly before his death.

MIGNE, Jacques Paul, a French editor, born at Saint-Flour, Cantal, in 1800. He was ordained priest in 1824, and in 1833 founded in Paris the journal *L'Univers religieux*. This he sold in 1836, and conceived the design of publishing a collection in 2,000 volumes of the best ecclesiastical authors ancient and modern, at low prices, and to be called *Bibliothèque du clergé*. From 1840 to 1845 he issued simultaneously, in 28 volumes each, the *Scripturæ Sacræ Cursus Completus* and the *Theologiæ Cursus Completus*. He next founded at Petit Montrouge an immense establishment uniting all the branches connected with printing, and employing hundreds of workmen, besides a large staff of clergymen as assistant editors. From this were issued complete collections of the Latin and Greek church fathers, the mediæval writers, modern controversialists, and pulpit orators. He also published *Encyclopédie théologique* (171 vols. 8vo, 1844-'66), comprising three series of dictionaries on subjects connected with religion. Archbishop de Quélen of Paris, deeming such an undertaking a mere commercial speculation, forbade the abbé Migne

to continue it, and as he did not comply withdrew his sacerdotal faculties. Migné had also founded the daily independent journal *La Vérité*, which ceased in 1856, and reappeared as a weekly ecclesiastical record in 1861. In 1868 his immense establishment was burned.

MIGNET, François Auguste Marie, a French historian, born in Aix, May 8, 1796. He was educated at Avignon, and in 1818 was called to the bar. In 1820 he obtained a prize offered by the academy of Nîmes for an essay on Charles VII. The acquisition in 1821 of a more important prize proposed by the academy of inscriptions and belles-lettres, for a dissertation on the state of the government and legislation of France during the age of Louis IX., induced him to abandon law for literature, and he removed to Paris. His liberal political views recommended him to the editor of the *Courrier Français*, to the staff of which he was attached for more than ten years; and about the same time he began a course of historical lectures at the Athénée which gained him a considerable reputation. In 1824 appeared his first important publication, *Histoire de la révolution française de 1789 à 1814* (2 vols. 8vo), frequently reprinted in France, and translated into the principal European languages. In 1830 he was associated with Thiers and Armand Carrel in the establishment of the *National* newspaper, and, having coöperated in the overthrow of the Bourbon dynasty, was appointed by Thiers upon his accession to office councillor of state and director of the archives in the ministry of foreign affairs. In 1832 he was elected a member of the academy of moral and political sciences, of which in 1837 he became the perpetual secretary; and in the same year he was admitted to the French academy. His political views were so distasteful to the government of Lamartine in 1848, that he was removed from his offices of director of the foreign archives and of councillor of state. Among his most important works are a series of documents entitled *Négociations relatives à la succession d'Espagne sous Louis XIV.*, with an introduction (4 vols. 8vo, Paris, 1836-'42), constituting a complete history of the reign of Louis XIV.; *Antonio Perez et Philippe II.* (8vo, 1845); *Vie de Franklin* (1848); *Histoire de Marie Stuart* (2 vols. 8vo, 1851); and *Charles Quint, son abdication, son séjour et sa mort au monastère de Yuste* (1854). In 1843 he published several biographical papers under the title of *Notices et mémoires historiques* (2 vols. 8vo); and he has since published *Éloges historiques* (8vo, 1863). In December, 1874, he submitted to the academy his *Notice historique de la vie et des œuvres du duc de Broglie*, who died in 1870. For many years he has been engaged upon a history of the reformation.

MIGNONETTE (Fr. *mignonnette*, diminutive of *mignonne*, darling), the common name for *reseda odorata*, a very popular garden annual. Though we derive our garden name as above

indicated, the French use *réséda* as the common name. This genus and a few others form the small family *resedaceæ*, which in a systematic arrangement occupies a place between *cruciferae* and *violaceæ*. The *resedas* are natives of Europe, northern Africa, and western Asia, and are herbaceous or somewhat shrubby plants, with alternate leaves, and greenish yellow or white flowers in long terminal spikes; the four-to seven-parted calyx is never closed, even in the bud; the petals as many as the calyx divisions, unequal, some or all deeply cleft or divided; stamens 10 to 40, borne on a glandular disk; ovary and pod of three to six carpels united, not quite to the top, to form a three- to six-lobed or three- to six-horned, one-celled pistil, which opens at the top long before the seeds are matured. The common mignonette (*R. odorata*) is much cultivated for the fragrance of its greenish white, inconspicuous



Mignonette (*Reseda odorata*).

flowers. In north Africa it is a perennial, but it is usually cultivated as an annual; the seeds are sown where the flowers are to bloom, and it springs up abundantly from self-sown seeds. For greenhouse culture, several seeds are sown in a pot and the plants thinned to three. What is called tree mignonette is only the ordinary kind which, by nipping off the flower buds, is prevented from blooming until it has formed a strong tree-like plant. By selection several improved strains have been produced. Mignonette is much used by florists to impart fragrance to bouquets of showy but inodorous flowers. The white mignonette (*R. alba*), with long spikes of odorless flowers, is rarely seen in gardens, and weld or dyer's mignonette (*R. luteola*) is sparingly naturalized. (See WELD.)

MIGUEL, Dom Maria Evaristo, a Portuguese prince, born in Lisbon, Oct. 26, 1802, died at Brombach, Baden, Nov. 14, 1866. He was the third son of John VI. of Portugal and Carlotta Joachima, a daughter of Charles IV. of

Spain, and spent his early life with his parents in Brazil, returning with the royal family to Portugal in 1821. When his elder brother Dom Pedro became emperor of Brazil, and his father established a constitutional monarchy in Portugal (1822), Dom Miguel, instigated by his mother, and aided by several of the nobility and clergy and by a large part of the troops, formed plots against the new constitution. He rebelled in 1823, and in 1824, with his mother, was expelled from the country. He went first to Paris, and then to Vienna. His father died on March 10, 1826, and his sister Isabella Maria was for a short time regent of Portugal. Dom Pedro relinquished the throne of Portugal (May 2) to his daughter, Dona Maria (afterward Dona Maria II. da Gloria), then in her seventh year, offering her hand in marriage to her uncle Dom Miguel, who was appointed to the regency July 3, 1827, and took the oath to maintain the constitution (Feb. 26, 1828). Soon afterward he defeated the garrisons of Oporto and other places which declared for Dom Pedro, convened new cortes, imprisoned or exiled the legislators who were likely to oppose him, and was proclaimed absolute king on June 25. He consolidated his power by the most despotic methods. Those implicated in the Oporto insurrection were mercilessly punished, and the prisons of the country filled with liberals; an expedition was sent against Madeira and the Azores, whose inhabitants had refused to acknowledge him, and the islands were subdued with the exception of Terceira in the Azores. Dom Miguel's cruel administration soon became odious to the people. Terceira continued to hold out against him, and the leaders of the constitutional party gathered there, established a regency in the name of Dona Maria, and collected a fleet and army with which Dom Pedro, who had abdicated the throne of Brazil (1831), sailed in June, 1832, for Oporto, which he took without bloodshed. In the following year his fleet, commanded by Sir Charles John Napier, destroyed that of Dom Miguel, and the army advanced to Lisbon, which declared unanimously for Dona Maria. Dom Miguel was abandoned by most of his followers, and in May, 1834, concluded at Evora a convention by which he agreed to quit Portugal. He went to Genoa and to Rome, and subsequently spent several years in London, where he was noted for debauchery. In 1851 he married the German princess Adelheid von Löwenstein-Wertheim-Rosenberg, by whom he had a son (Miguel, born in 1853) and four daughters.

MIKADO, a term of doubtful etymology, used to designate the emperor of Japan. The word does not occur in the most ancient Japanese books, but is the one, out of many names given to the emperor, which has obtained the greatest currency. The derivation of *mikado* usually accepted by the Japanese is from *mi*, honorable, august, and *kado*, a gate, equivalent to the Turkish title Sublime Porte. Another

derivation, given by Satow, is from *mika*, grand, awful, and *to*, place. It originally meant the palace of the sovereign, but by a figure of speech especially common in Japanese, it is used for the sovereign himself, just as *dairi*, the palace, with the suffix *sama*, is also used. Other terms applied to the emperor are *kotei*, judge of the world, or ruler over nations; *tenshi*, son of heaven; *kinri*, the forbidden interior; *dairi*, the inner interior; *chotei*, hall of audience; and *tenno*, heaven-king. Tenno is the official designation now used, and all Japanese ministers and consuls are accredited as representatives of "his imperial majesty the tenno of Japan." The first mikado, Jimmu Tenno, who is usually regarded as a historical character, began to reign about 660 B. C., since which time 123 emperors have occupied the throne. The mikado claims divine descent from the gods or *kami* who created heaven and earth (or Japan). He has no family name, and no mikado ever takes the name of any of his predecessors. The reigning mikado (1875) is Mutsuhito, second son of the emperor Komei Tenno and the empress Fujiwara Asako. He was born in 1850, succeeded his father Feb. 3, 1868, and married Haruko, daughter of Ichijo Tadaka, a noble of the second degree of the first rank, born in June, 1850. (See JAPAN, vol. ix., pp. 542-56.) The "unbroken line of descent through 25 centuries" claimed for the mikado has been made possible and even probable by the existence in Japan of the custom prevalent in Asiatic nations of adoption and concubinage. The mikado is allowed 12 *niogo* or concubines, though the number is rarely filled up. As an additional safeguard against failure of issue, four cadet families of the imperial blood called the *shishinuo* have long been set apart, from which heirs to the throne might be chosen. The present mikado, abandoning the habits of seclusion practised by his ancestors, appears in public, and gives audience to members of the diplomatic corps in Japan, to his own officers, and to the foreigners employed in the government service. He dresses, eats, rides, and acts like a European sovereign. The real governing power in Japan, however, resides in the *dai jo kuan*, or supreme council.

MIKLOSICH, Franz von, a Slavic philologist, born at Luttenberg, Styria, Nov. 20, 1813. He studied philosophy and jurisprudence at Gratz, and became a teacher in 1837. He was a member of the Austrian parliament in 1848-'9, and afterward became Slavic professor in the high school of Vienna. In 1862 he was made a life member of the Reichstag. He has published *Radices Linguae Palaeslovenicae* (Leipsic, 1845); *Lexicon Linguae Palaeslovenicae* (Vienna, 1850; 2d ed., 1865); *Formenlehre der altslovenischen Sprache und Lautlehre der altslovenischen Sprache* (1850); *Vergleichende Grammatik der slawischen Sprachen* (1852-'71) which is his principal work; *Chrestomathia Palaeslovenica* (1854 and 1861); *Die slawischen Elemente im Neugriechischen*

(1870); and *Beiträge zur Kenntniss der slawischen Volks poesie*, including *Die Volksepik der Kroaten* (1870) and *Albanische Forschungen* (3 parts, 1871). With J. Müller he edited *Acta et Diplomata Græca Medii Ævi* (3 vols., 1860 *et seq.*).

MILAM, a central county of Texas, bordered N. E. by the Brazos river, intersected by Little river, and drained by its tributaries the San Gabriel, Brushy creek, and others; area, 1,048 sq. m.; pop. in 1870, 8,984, of whom 2,977 were colored. The surface is generally rolling, in some places hilly and broken, and the soil is mostly fertile. The chief productions in 1870 were 201,117 bushels of Indian corn, 21,391 of sweet potatoes, 21,881 lbs. of wool, 37,549 of butter, and 5,143 bales of cotton. There were 4,543 horses, 4,106 milch cows, 24,706 other cattle, 6,498 sheep, and 16,672 swine. Capital, Cameron.

MILAN (Ital. *Milano*; Ger. *Mailand*). **I.** A province of Italy, in Lombardy, bordering on Como, Bergamo, Cremona, Piacenza, Pavia, and Novara; area, 1,155 sq. m.; pop. in 1872, 1,009,794.

The surface in the north is hilly, falling away gradually to the plains of the south. The river Adda bounds the province partly on the E., and the Ticino on the W.; along these streams the land is low and marshy, but on the whole the soil of the province is remarkably fertile. It is divided into the districts of Abbiategrasso, Gallarate, Lodi, Milan, and Monza. **II.** A city (anc. *Mediolanum*), capital of the province, in lat. 45° 28' N., lon. 9° 11' E., 155 m. W. of Venice, and 78 m. N. E. of Turin; pop. in 1872, 199,009. It lies in a fertile plain S. of the Alps, between the small streams Lambro and Olona, which connect by the Naviglio Grande canal with the Ticino and by the Mortesana canal with the Adda, establishing a communication with the Lago Maggiore, the lake of Como, and the Po. By railway it is connected with the principal cities of Italy. Unlike other celebrated Italian cities, Milan combines remarkable natural and architectural attractions with appearances of comfort and material prosperity; and it is justly regarded as one of the pleasantest cities of Europe. It is nearly circular. The length of the canal which forms the circumference of the most densely populated part is 5 m.; and the whole circuit of the modern city is 8 m., and

that of the outer wall 10 m., the latter area comprising, besides the city proper and its suburbs, a great number of gardens and orchards. The principal gates are the porta Principe Umberto, opened in 1865, through which all travellers by rail enter the city, and the porte Garibaldi, Nuova, Venezia, Vittoria, Vigentina, Ludovica, Romana, Ticinese, Vercellina (now Magenta, built to receive Napoleon when he came to assume the iron crown), and Tenaglia. The last leads to the Simphon, and opens upon an esplanade called piazza di Castello. The street running all round outside the city is called strada di Circonvallazione. Some of the streets are narrow and winding, but they are generally well paved, and some of the thoroughfares are admirable.



Cathedral of Milan.

Many streets parallel to and in the immediate vicinity of the canal retain the name of *terrazzi* or terraces. The piazza Borromeo is adorned with a statue of that saint. The piazza di Castello or esplanade was much embellished by Eugène de Beauharnais during his viceroyalty. The castle is now used as a barrack, and on the N. E. side is the piazza d'Armi. The *arco della pace*, opening into it, is second only to the *arc de l'étoile* in Paris; it is a magnificent white marble triumphal arch, principally the work of Cagnola, begun in 1807 and completed in 1838. Close by the piazza d'Armi is the Arena, used for shows and races, and capable of accommodating 30,000 spectators. The most fashionable promenades are the streets called *corsi*, which lead to the principal gates.

The corso Vittorio Emanuele, beyond the porta Venezia, is the most beautiful and the most frequented. Near by is the new public garden, beautifully laid out, and adorned with a bronze statue of Cavour. A magnificent equestrian statue of Napoleon III. was erected in one of the public squares in 1875.—The houses of Milan are generally from three to five stories high. There are not as many sumptuous mansions as in Genoa, Rome, and Florence, but the Visconti, Belgiojoso, Annone, and Belloni palaces are fine architectural monuments, containing many works of art. The archiepiscopal palace, the palazzo della Corte (the residence of the king when he visits Milan), the palazzo Marini or of the treasury, the palace of justice, that of the government, the palace of science and art (Brera), the mint, and the famous *monte di stato* or public loan bank, are among the most remarkable public buildings. But they are all eclipsed by the *duomo* or cathedral, next to St. Peter's the largest church in Italy. It is almost in the centre of the city, in the piazza del Duomo. It was begun by Giovanni Galeazzo Visconti in 1387, but is not yet finished, although Napoleon I. gave a powerful impulse to its completion. Though the main design has been carried out, the details present inconsistencies and anachronisms. The interior is crowded with monuments of prelates and princes and relics of saints. In fretwork, carving, and statuary, it is said to eclipse all other churches in the world; and the ornamentation is so profuse that much of the value of the details is lost in the mass. (For its dimensions and general description see CATHEDRAL, vol. iv., p. 118.) One of the most remarkable churches is that of St. Ambrose, renowned for its antiquity and as the scene of ecclesiastical councils, political conflicts, and the coronation of sovereigns. In the refectory of the ancient Dominican convent, the present church of Santa Maria delle Grazie, is the celebrated fresco of the "Last Supper" by Leonardo da Vinci. The church of Santa Maria, near that of San Celso, in the Borgo San Celso, is noted for its beauty. The church of San Carlo Borromeo, begun in 1838 and opened in 1847, built after a design of Amati, is surmounted by a dome only second in size to that of the Pantheon, and contains a marble group of the dead Saviour and the Virgin by Marchesi; but the interior is unfinished. Among other notable churches containing celebrated pictures and monuments are San Fidele, San Lorenzo, San Marco, and San Vittore al Corpo, formerly the Basilica Porziana, which vies in dignity with the *duomo*. Milan abounds with charitable institutions, which possess property to the amount of \$40,000,000. The principal of them is the great hospital, 880 ft. long by 360 ft. in depth, founded by Francesco Sforza in the 15th century, open to all applicants, and containing a free dispensary; among other endowments, it has received two legacies, respectively of \$600,000 and \$1,800,000, from

private individuals. Among the other hospitals are the large foundling hospital; the Trivulzi hospital, for the relief of the aged, founded in 1771 by Antonio Trivulzi, who devoted his palace to the purpose; and the lazaretto, the most extensive of them all, situated 'outside of the walls, founded in 1461 and completed at the end of the century, for the plague-stricken, and consisting of four ranges of buildings, each nearly 1,200 ft. long, which enclose an area of more than 30 acres.—Education is represented in Milan by the archiepiscopal seminary, two lyceums, three gymnasiums, and a number of colleges and schools, including one for deaf mutes, one for veterinary surgeons, and one for the technological sciences. There are an institute of science, a geographical military institute noted for issuing excellent maps, a collection of zoölogy and palæontology in the *museo municipale di storia naturale*, and other establishments and societies for the promotion of science, literature, and art. The intellectual activity of the city has been rapidly increasing since the overthrow of the Austrian rule in 1859, and is particularly evident in the great number of newspapers and periodicals published there. Probably more books are issued in Milan than in any other city of Italy. The Milanese school of engravers has acquired a high reputation within the last 40 years. The academy of fine arts is one of the most celebrated institutions of its kind in Europe, and the *palazzo delle scienze e delle arti*, in which it is situated (commonly called the Brera from having originally been a Jesuit college called Santa Maria in Brera), is one of the chief ornaments of the city. It contains an extensive gallery of paintings, rich in works by Lombard and Bolognese artists; the public library of nearly 190,000 volumes, including the works bequeathed to it by Haller; a number of medals and an archæological library; a collection of casts; a botanic garden, and an observatory, one of the best in Italy. The new Victor Emanuel gallery was opened by the king, Sept. 15, 1867. Besides several other special libraries in the Brera, Milan is the seat of the world-renowned Ambrosian library, founded by Cardinal Borromeo, and carefully explored by Cardinal Mai, who made there important discoveries of palimpsests. (See AMBROSIAN LIBRARY.) The most extensive private library in Milan is in the palazzo Trivulzi, which contains also a valuable collection of coins, and of Greek, Roman, and mediæval antiquities. The theatres and theatrical entertainments at Milan are numerous and excellent. La Scala can accommodate between 3,000 and 4,000 persons. Attached to it is an academy of dancing, and it also contains a *sala di ridotto* for concerts and balls. Among the other principal theatres are the Canobbiano, the Carcano, the Teatro Re, and the Filodrammatico, conducted exclusively by amateurs. The city contains fine coffee houses, club houses, hotels,

elegant shops, and a magnificent bazaar (*galleria di Cristoforo*). Milan has been the seat of an archbishop since the time of the last Roman emperors. The fortifications, consisting of a bastioned wall and other works, form an irregular polygon, and are not strong enough to withstand a siege. In the inland trade, the commercial activity is greater than that of any other city in Italy. The principal articles of commerce are silk, grain, rice, and cheese. The manufactures of silk goods, ribbons, felt and silk hats, turners' work, cutlery, and porcelain are important.—Ancient Milan (*Mediolanum*) was the chief place of the Insubres in Cisalpine Gaul, and for a long time the capital of that province. It fell into the hands of the Romans about 222 B. C. Under the empire it advanced rapidly in prosperity and in political and intellectual importance. It became the central point from which the high roads of northern Italy radiated; its admirable position midway between the Alps and the Po made it the natural capital, and it was the imperial residence of Maximian and some of his successors for the greater part of the 4th century. By his edict issued at Milan in 313 Constantine granted tolerance to the Christians. St. Ambrose was bishop of Milan more than 22 years, till his death in 397, and his personal influence made his metropolitan see paramount in Christendom. Several councils were held there in the 4th century, and several others in later times. In 452 the city was plundered by Attila. It next became the capital of the Gothic kings, and was recovered by Belisarius in 537, but retaken by the Goths in 539, and almost entirely destroyed and nearly depopulated. In 569 it was occupied by the Lombards, and in 774 it came into the possession of Charlemagne. Several of his successors assumed either at Milan or at Pavia the iron crown. After the coronation of Otto I. in 961 Milan formed part of the German empire, and its governors were appointed by the emperors. The city was besieged by Conrad II. in the early part of the 11th century, on account of the attempt of Archbishop Heribert and others against the imperial authority. In the 12th century, when Milan was the most wealthy, populous, and influential city in Lombardy, it became the principal opponent of the German emperors, and was twice besieged by Frederick Barbarossa (in August and September, 1158, and again from May, 1161, to March, 1162); and after the second siege it was almost entirely destroyed. Recovering from the effects of this calamity, it was declared a free city after the victory of the Lombard league at Legnano in 1176; and although pledging itself by the treaty of Constance (1183) to recognize the German emperors as chief feudatories and magistrates, it was permitted to withhold from them the revenues of the immense municipal domains. The efforts of the citizens to liberalize their institutions were thwarted by the conflict between the Guelphs and Ghibellines, the political influence being

divided between the family Della Torre, the representatives of the former, and the Visconti, of the latter party. The Della Torre were successful in monopolizing the office of *podestà* or chief magistrate from 1237 to 1311, when a revolt against the emperor Henry VII. brought the Visconti into power. Matteo Visconti and his successors extended the power of Milan over almost all parts of Lombardy, and in 1395 it became the capital of the duchy of Milan, the first duke being Giovanni Galeazzo Visconti. After the extinction of the male line of the Visconti family (1447), Francesco Sforza, the husband of an illegitimate daughter of the last of the Visconti, secured the duchy for himself and his descendants. The claim of France upon Milan, derived from intermarriage with the Visconti, was taken up by Louis XII. (1499), and more strongly by Francis I., who was opposed by the emperor Charles V.; and the duchy was alternately in the hands of the French and of Sforza until Francis was obliged to relinquish his pretensions by the treaty of Madrid (1526). Francesco Sforza II. having received Milan in fief from Charles V., it reverted to that emperor after the extinction of the male line of the Sforzas (1535); he gave it to his son Philip II., and it remained in the power of Spain for nearly two centuries. From the end of the 14th to that of the 16th century Milan was celebrated for its manufactures of arms and armor. The city was equally renowned for the elegance and tastefulness of its finery, and became so noted as a leader of fashions in Europe that the English word milliner originated from Milanese, an importer of fashionable articles from Milan. In 1576 the city was desolated by the plague. At the close of the war of Spanish succession the duchy was allotted to Austria (1714), and constituted together with Mantua the Austrian portion of Lombardy. After the invasion of the French in 1796 it became part successively of the Cisalpine republic (1797), of the Italian republic (1802), and of the kingdom of Italy (1805). In 1814 it became a province of Austria and part of the Lombardo-Venetian kingdom. Soon after the French revolution of 1848 Milan became the scene of disturbances; and after the departure of the viceroy, Archduke Regnier, a violent insurrection broke out, in consequence of which Gen. Radetzky, commander of the citadel, was compelled to evacuate the city, which was occupied by the Piedmontese, who established a provisional government. After the defeat of Charles Albert at Custoza (July 25) the republicans of Milan overthrew the provisional government; but on Aug. 5 the city was compelled to submit to Radetzky, who entered it with 50,000 men, and kept it in a state of siege till December. The disturbances of March, 1849, and the rising of Feb. 6, 1853, were speedily suppressed. The rule of Austria was brought to a close in 1859 by the French and Sardinian armies; and the

Austrian troops evacuated Milan June 5, the day after the battle of Magenta. Napoleon III. and Victor Emanuel made their entry into the city June 8, and by the peace of Villafranca (July 11) Milan and the rest of Lombardy were ceded by Austria to France, to be transferred by the latter to Sardinia. The city was the scene of some disturbances by Neapolitan soldiery, April 29 and 30, 1861, but these were soon suppressed.

MILAZZO, or *Melazzo* (anc. *Mylæ*), a seaport town of Sicily, on the N. coast, in the province and 18 m. W. of the city of Messina; pop. about 7,000. It is built on a promontory which forms a spacious bay, the *Basilicus Sinus* of the ancients, affording excellent anchorage, and is divided into two parts, one on the promontory strongly fortified, and the other at the harbor near the bottom of the bay. The exports are fish, wine, oil, olives, and fruits of every kind. The tunny fishery is considerable. The plain of Milazzo, bounded by the mountains of Pelorum, is noted for its beautiful scenery. The promontory of *Mylæ* was the scene of a victory of the Roman fleet over that of the Carthaginians in the first Punic war, 260 B. C., gained by means of the grappling implements called *corvi*, then used for the first time. In 36 A. D. Agrippa, the commander of Octavius's fleet, defeated there that of Sextus Pompey. In 1719 Milazzo was unsuccessfully besieged by the Spanish army. On July 20, 1860, Garibaldi here defeated the Neapolitans, a victory which resulted in giving him possession of Messina.

MILBURN, William Henry, an American clergyman, born in Philadelphia, Sept. 26, 1823. In early childhood he lost the sight of one eye wholly and of the other partially, and in later life consulted the most eminent oculists in Europe and America, but without avail. At the age of 20 he became a Methodist Episcopal clergyman, and during several years of itineracy travelled more than 200,000 miles in the United States. In 1856 he was chaplain of the house of representatives at Washington. In 1859 he visited England in company with Bishop Simpson and the Rev. Dr. McClintock, and delivered lectures in the principal cities. Subsequently he was ordained in the Protestant Episcopal church, but in 1872 he returned to Methodism. He has published "Rifle, Axe, and Saddle Bags" (1857); "Ten Years of Preacher Life" (1859); and "Pioneers, Preachers, and People of the Mississippi Valley" (1860).

MILDEW (Ang.-Sax. *mildeáw*; Ger. *Mehlthau*, meal dew), a name applied to various minute fungi, especially by agriculturists and horticulturists to those which are found upon and are injurious to their crops. The name was originally applied to the white moulds; in common use it is not restricted to these, but designates also dark-colored fungi, and those of different genera and sub-orders. (See FUNGI.) One of the most widely disseminated mildews is that which attacks the grape vine, appearing as grayish spots upon the under sur-

face of the leaves, the young shoots, and the stems of the fruit; it often destroys the foliage, and consequently the fruit fails to ripen. It has produced incalculable damage to the vineyards of Europe as well as of this country, and though some varieties are more susceptible to its attacks than others, almost all in certain seasons are affected. An English gardener, Mr. Tucker, gave special attention to the subject, and the fungus, in acknowledgment of his services, was called *oidium Tuckeri*, a name by which it is generally known in horticultural works; but Dr. Berkeley, a high authority in cryptogamic botany, considers it not an *oidium*, but a form of an *erysiphe*, a very polymorphous genus, in which there are five different kinds of fructification. Whether this view be correct or not, the plant is now quite well understood, as are the means of combating it. With grapes grown under glass, where the cultivator can control the humidity of the atmosphere, mildew is easily managed; but in the open vineyard it demands constant vigilance, and the vineyardist should daily examine the vines most liable to its attacks, and at the first indication of its presence apply sulphur. In some of the wine-growing districts of Europe sulphuring is practised systematically, whether mildew appears or not. With a view to destroy the spores, the vines before the buds swell and the trellises are sprinkled with a solution of 8½ oz. common salt and 4 oz. saltpetre in 36 oz. of water, and 10 drops each of oil of rosemary and lavender are added; one part of this is mixed with 100 parts of water and thoroughly applied by means of a syringe. As soon as the leaves expand they are well dusted with flowers of sulphur, for the application of which a bellows has been especially contrived which blows the sulphur as a cloud of dust, and when the bellows is properly handled every part of the vine will be powdered with it. A similar application is made when the vines are in blossom, another when the grapes are as large as a pea, and a fourth when they begin to color. In this country the grape growers generally content themselves with using sulphur at the first appearance of the trouble. Its efficacy is well established, provided it be applied in time. Mildew usually appears upon the grape in prolonged warm and damp weather, and it often follows a sudden change of temperature.—Rose growers are sometimes great losers by mildew; the leaves become parched and blistered, and the young stems and unexpanded buds are misshapen and covered with a gray mould; this is attributed to a different plant



Grape-vine Mildew.

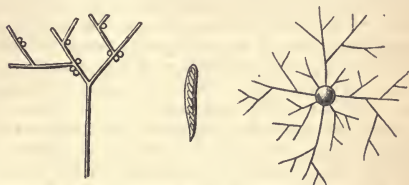
from that upon the grape, *spherotheca pannosa*. A similar blight comes upon hop vines, often seriously affecting the crop. Cucumbers, lettuce, and other succulent vegetables are injured in a similar manner in unfavorable seasons; and in this country a late crop of peas is almost impossible by reason of an *erysiphe* which covers the foliage in such abundance that the plants appear as if dusted with a white powder; the European pea mildew or blight is *E. Martii*, but we are not aware that our species has been identified as the same. The pea is also attacked by another fungus, *peronospora*



Pea Mildew (Leaflet natural size, Fungus magnified).

vicia. Near large cities immense quantities of lettuce are forced under glass, to supply the demand during winter; were there no difficulties to contend with, this would be an exceedingly profitable culture, but often the grower finds his crop, just as it is nearly ready for market, rendered almost worthless by the advent of a mildew or mould. *Peronospora gangliiformis* is one of the destructive lettuce fungi, but it is probably not the only one. As with other plants under glass, lettuce is usually attacked by mildew after a sudden change of temperature, and all the grower can do is to preserve the proper conditions of heat and moisture as preventives, for when it is established there is no remedy.—The most important of these minute fungi is the wheat mildew, or rust as it is more generally called in this country, *puccinia graminis*, of which figures are given in the article FUNGI. This obstacle to successful wheat growing has been known from very early times, but its real nature was only discovered early in the present century. With a view to destroy any spores that may be with the grain, it is common to treat the seed wheat with a solution of sulphate of copper.—There is scarcely a cultivated or wild plant which is not in some seasons the host of these fungi, which are so minute that their structure can only be seen by the aid of strong magnifiers; in one sense they are among the most important plants to the cultivator, and often determine his success or failure; the minute mildew of the grape in the wine regions of Europe has brought ruin to whole neighborhoods and driven families to emigration.—Another set of fungi attacks dead vegetable matter. When linen or cotton fabrics are kept in a damp place or laid away before they are perfectly dry, they become covered with dark spots which the housekeeper knows as mil-

dew; this is a species of *cladosporium*, which in some of its forms attacks the leaves of the apple and pear, and also produces the dark



Paper Mildew (magnified).

blotches sometimes found on otherwise fair specimens of the fruit. Paper, whether upon damp walls or stored in a damp place, is attacked by a *chatomium*, an *ascotricha*, or some other form of mildew, and similar fungi appear upon damp plastered walls. (See FUNGI.)

MILE (Lat. *mille passuum*, 1,000 paces of 5 ft. each), a measure of length or distance. According to the estimates of the length of the Roman foot, the ancient mile must have been 1,614 or 1,618 English yards, while the English statute mile amounts to 1,760 yards or 5,280 ft. There are 69·16 statute miles to a degree of the equator, and the English geographical mile is $\frac{1}{60}$ of a degree, or 1·1527 statute mile. The distance expressed by the term mile varies; the following are its values in some countries:

COUNTRIES.	Yards.	Statute miles.
Modern Roman mile.....	1,625	0·925
Irish mile.....	2,240	1·273
German short mile.....	6,559	3·897
German geographical mile.....	8,237	4·611
Swiss mile.....	9,153	5·201
German long mile.....	10,126	5·758
Swedish mile.....	11,700	6·648

MILETUS, an ancient city of Asia Minor, situated in the northern part of Caria, but politically belonging to the Ionian confederacy. It stood at the northern extremity of a promontory formed by the Grium range, opposite Priene and the headland of Mycale, and commanding the entrance of the Latmic bay, into which the Mæander flowed. Miletus had four harbors, protected by a group of islands, the principal of which was Lade. It is difficult to determine the precise position of the now ruined city, owing to the continued changes produced in the bay and its surroundings by the action of the Mæander, which, bringing down immense masses of soil, has filled up the northern portion of the water basin, and changed Lade and the other islands into parts of the continent. The territory of Miletus extended round the bay as far as the promontory of Mycale on the north and Cape Posidium on the south. The earliest inhabitants were Carians, Leleges, and Cretans, and it derived its historical name from Miletus, a leader of the latter, being also called

Pityusa and Anactoria. It was subsequently settled by Ionians from Greece under the lead of Neleus, the younger son of the last Athenian king, Codrus. It was celebrated as an industrial and commercial city, and in the early portion of Grecian history it was the foremost maritime power, extending its commerce and colonies all over the shores of the Mediterranean, the Propontis, and the Euxine. Among its colonies were Naucratis in the delta of Egypt, Sinope in Paphlagonia, Panticapæum in the Taurian peninsula (Crimea), and Odessus, Olbia, Tomi, and Istropolis, on the W. shores of the Euxine. At the same period it also occupied a dignified place among the most enlightened cities of Ionia, being the birthplace of the philosophers Thales and Anaximander, and of the historians Cadmus and Hecataeus. It successfully defended its independence against Sadyattes and Alyattes of Lydia, but succumbed to the last monarch of that kingdom, Cræsus; and after his fall it was subdued by the army of the Persian conqueror under Harpagus. Under Aristagoras, the brother-in-law of its governor Histæus, it revolted with the other Ionian cities against Darius Hystaspis, receiving aid from the Athenians, but was finally subdued and destroyed by the Persians (494 B. C.), the great revolt leading to the first invasion of Greece. Recovering under the later

Persian kings, it vainly defended the cause of the last of them against Alexander (334), and suffered a new ruin. Having belonged for about a century to the Seleucide, it was annexed to the territories of Rome after the defeat of Antiochus the Great, and shared the fate of the other cities of the province of Asia, dwindling away under the Byzantine rule, until it was totally destroyed by the Turks. For some years excavations have been conducted at the cost of the Rothschilds, who in 1873 presented to the administration of the fine arts in Paris several columns and sculptures from the temple of Apollo Didymus. Remains of an aqueduct and of several temples have been found.

MILFORD, a town of Worcester co., Massachusetts, on the Milford branch of the Boston and Albany, and on the Milford and Woonsocket and the Hopkinton railroads, 30 m. S. W. of Boston; pop. in 1870, 9,890. It is one of the largest boot manufacturing towns in New England, and contains machine shops and other manufactories, a national and a savings bank, a weekly newspaper, and six churches.

MILFORD HAVEN, a harbor of Pembrokeshire, Wales, the deepest, safest, and most commodious in Great Britain, formed by an inlet of St. George's channel, N. W. of the entrance to Bristol channel. Its opening is toward the south, but after penetrating a short distance



Milford Haven.

inland it changes its direction and runs east, branching off into numerous bays, creeks, and roads. It is about 10 m. long and from 1 to 2 m. wide, and is defended by two batteries. The tides rise from 28 to 30 ft., and at low water it contains as great an area of deep anchorage as the aggregate of Plymouth, Portland, and Holyhead. It has substantial docks

and piers, and is a great resort for shipping. A royal dockyard was established here in 1790, but it was removed to Pembroke in 1814. The number of entrances at the port in 1871 was 31, tonnage 8,190; clearances 5, tonnage 2,183. The imports from the United States in 1871 were valued at £2,051, from other countries £24,355. Milford (pop. in 1871, 2,836) is a

modern place, and is engaged chiefly in ship building. It is connected by rail with the South Wales line.

MILFORT, Le Clerc, a French adventurer, born in Mézières about 1750, died there in 1817. He came to America, travelled through the British colonies, and about 1776 visited the Creek nation. Here he attached himself to the Creek chieftain, Alexander McGillivray, whose sister he married. He was made a war chief by the Indians, and performed active service against the whigs of Georgia during the American revolution. He remained with the Creeks for 20 years. In 1796, having lost his wife and his friend and brother-in-law McGillivray, he returned to France, and was made a general of brigade by Bonaparte. He married again in France, distinguished himself in 1814 by a gallant defence of his own house in Vouziers, whither he had removed from Mézières, against a party of Russians, and soon afterward returned to Mézières. He published *Mémoires, ou coup d'œil rapide sur mes voyages dans la Louisiane, et mon séjour dans la nation creeke* (8vo, Paris, 1802).

MILHAU. See MILLAU.

MILITARY FRONTIER (Ger. *Militärgrenze*; Hung. *Határőr-vidék*), a region, and formerly a political division, of the Austro-Hungarian monarchy, between lat. 44° and 47° N., and lon. 14° and 23° E., bounded N. by Carniola, Croatia, Slavonia, and Hungary, E. by Transylvania and Roumania, S. by Servia, Bosnia, and Dalmatia, and W. by the Adriatic; area, about 13,000 sq. m.; pop. in 1870, 1,041,123. Its breadth is greatest in the W. part, which is traversed by continuations of the Julian Alps, branches of which are the Great and Little Capella ranges, and by the Dinaric Alps, while the easternmost division is crossed by offshoots of the S. E. Carpathians. The middle parts are mostly level and exceedingly fertile. The highest elevations are Mounts Gugu (7,700 ft. high) and Sarka (7,300 ft.), near the Transylvanian boundary, and Mount Klek or Ogulin Head (Ger. *Oguliner Kopf*), near Zengg on the Adriatic (6,900 ft.). The principal rivers are the Danube, which traverses the country in a S. E. direction between Peterwardein and Semlin, continuing its course E. on the southern frontier as far as Orsova, and receiving the waters of the Theiss, the Bega, and the Temes; the Save, which separates the Military Frontier from Bosnia and Servia, and falls into the Danube between Semlin and Belgrade in Servia; and the Kulpa and the Unna, affluents of the Save, flowing respectively on the confines of Croatia and Bosnia. There are some mountain lakes in the W. part. Of mineral waters, the sulphur springs of Mehádia, near the confines of Wallachia, are most celebrated, the place being also famous for picturesque scenery. The climate is very mild in the level country, but severe in the mountains. The principal productions are the various kinds of grain, maize, tobacco, flax, hemp, fruits, and wine; and of minerals, silver,

iron, copper, lead, and some gold. The inhabitants are mostly of Slavic race, Croats, Slavonians, Serbs, &c.; but there are also Wallachs, Magyars, Germans, Greeks, Jews, Clementines (Albanians), and gypsies. The predominant religions are the Greek and the Roman Catholic, the former having its centre at Carlovitz on the Danube, the seat of a patriarch or archbishop. There are few towns, but some of them, as Peterwardein, Carlovitz, Semlin, Pancsova, and Old Orsova, all on the Danube, Zengg, Carlago, and Brod, in the western division, and others, are important on account of their situation.—The country was originally formed into a military organization by Ferdinand I. (died in 1564) as a barrier against the Turks, and it was reconstituted in 1807 and again in 1850. Under the military organization almost the entire male population above 20 years old was formed into 14 regiments of infantry, 1 of hussars, and 2 battalions of boatmen. All agricultural estates were the common property of the Frontier communities, the rural buildings being partly inalienable and partly individual property. Arms, accoutrements, and ammunition, and all necessities during military service, were supplied by the government, and in all military respects the frontiersmen were subject to the rules of the Austrian army. Before the reorganization of Austria in 1867 the Military Frontier was a separate crown land of the empire. By that reorganization its reunion with the crown of Hungary was virtually established; and at the meeting of the delegations of Cisleithan Austria and Hungary in 1869, it was resolved to abolish gradually the peculiar institutions of the Military Frontier, and to incorporate one of the two military commanderies with Hungary proper, and the other with Croatia. The transformation was nearly completed in 1874.

MILITARY LAW. See COURT MARTIAL, and MARTIAL LAW.

MILITARY SCHOOLS, institutions in which soldiers are instructed or youths educated for the army. Of the former class, the "soldier schools" of Prussia, established in every regiment or battalion, in which the privates are taught the common rudimentary branches, and sometimes singing also, are the most remarkable. There are similar schools in the Austrian, British, and other European armies. Academies of the second class, intended to educate officers, were not unknown in antiquity, and are now an indispensable part of the military system of all great nations. The first military school in France was established by Louis XV. at Vincennes in 1751; it had 500 pupils, all of whom were young noblemen. Soon after its establishment it was removed to the edifice built for it in the Champ de Mars, Paris, and it is still the principal military school of France. The famous school of St. Cyr, near Versailles, was originally founded by Bonaparte at Fontainebleau in 1802, but was a few years later removed to its present location, and still retains the prin-

principal features of its first organization. It has 350 pupils between 18 and 20 years of age, who after a course of two years are sent, some to the *école d'état-major*, others to the cavalry school at Saumur, and the rest to the army as sub-lieutenants of infantry. There is also an important military school at La Flèche, founded by Louis XV. in 1764. Even before the seven years' war the French had an artillery school in every town where a regiment of that arm was garrisoned, and their example has been followed by Germany and Austria. In Prussia the education of officers is provided for by high schools for each arm in every army division, and by the royal military school at Berlin, founded by Frederick the Great, to which the most deserving young officers are admitted from the line. In Great Britain the royal military college at Sandhurst, which comprises a cadets' college and a staff college, and the royal military academy at Woolwich, designed as an artillery and engineer school, enjoy a high reputation. The United States military academy at West Point, founded in 1802, ranks second to no institution of the kind in the world. Cadets are admitted on the recommendation of members of congress and the president of the United States, and the act of congress of Feb. 2, 1872, increasing the congressional representation of the several states, enlarged the corps of cadets from 293 to 342, the present legal number. The education and subsistence are gratuitous, which is not the case at Sandhurst, Woolwich, St. Cyr, &c. The course of study, under a superintendent and 40 professors and instructors, 32 of whom are army officers, covers a period of four years. Since 1866 the standard of qualifications has been raised, and appointments to cadetships must now be made one year previous to admission. To the end of 1873 about 2,500 had graduated at West Point, and the total cost of the school since its establishment was less than \$9,000,000. Apart from West Point, military instruction in the United States is provided for as follows: The act of July 28, 1866, authorized the president, "for the purpose of promoting knowledge of military science among the young men of the United States," to detail officers of experience to act as professors in institutions of learning having upward of 150 male students; and several institutions have availed themselves of such instruction. By the same act provision is made for the instruction of enlisted men in the common English branches of education, and especially in the history of the United States, at every post, garrison, or permanent camp. In 1867 an artillery school was organized at Fortress Monroe, to which one battery from each of the five regiments of artillery is ordered every year, for theoretical and practical instruction in that branch of military tactics. In nearly every military department there are now schools of instruction in military signalling and telegraphy, and for this service there is special recruiting. The Virginia military institute, at

Lexington, was organized in 1839; in 1873 it had 19 instructors and 260 students; it owns property valued at \$300,000, and received an annual appropriation of \$15,000 from the state, which appoints a certain number of the cadets. Its course of instruction is similar to that of West Point. The Kentucky military institute at Frankfort, was organized in 1846; in 1873 it had 6 instructors and 78 students; it owns property valued at \$75,000, and is controlled by a board of visitors appointed by the governor of the state. Two or three American colleges, like the university at Norwich, Vt., are under a partial military organization, and in several of the private schools throughout the country the pupils wear a uniform and are drilled in the manual of arms.

MILITIA (Lat. *miles*, a soldier), a body of armed citizens trained to military duty, who may be called out in certain cases, but may not be kept on service, like standing armies, in time of peace. It differs from the *levée en masse* in having a regular organization at all times. Something equivalent to a militia seems to have existed in England in the time of the Saxons. The ceorles or peasants held their lands on condition of military service, every five hides of ground in most counties being charged with the equipment of one man, and were banded in bodies or companies, the command of which was given to the ealdormen elected by the people in the folk-motes. The peasants were enrolled under the banners of their immediate lords, but in case of rebellion or invasion the state had a paramount claim upon their services, and the lords had no further authority over them than the privilege of leading them in battle. The organization of this species of militia has been attributed to Alfred, but it seems certain that a national force called the *fyrð*, regulated probably by similar principles, existed before his time. Under the Normans the *fyrð* continued to be maintained simultaneously with the feudal armies, and ultimately it became the source both of the modern British militia and of the sheriff's *posse comitatus*. It was not till the reign of Edward III. that a statute was passed providing that no militiaman should be sent out of his own county except in case of invasion or other grave danger to the realm, nor out of the kingdom in any case. In the fifth year of Henry IV. a law was enacted empowering the king's "commissioners of array" to array and train all men-at-arms, to cause all able-bodied men to arm themselves according to their substance, to amerce those unable to bear arms, and to require the services of persons so armed at the seashore or elsewhere in season of danger. The command of the militia was often given to the persons charged with these commissions of array, but more frequently it rested with the sheriffs or high constables, each in his own county. Such was the organization of the militia when the parliament of Charles I. in 1642 passed a bill vesting the control of this

force, as well as the command of all the forts, castles, and garrisons, in certain commissioners in whom they could confide. The king refused his assent to the bill; and when the parliament thereupon declared the kingdom in danger and issued orders to muster the militia, he issued commissions of array to some of the nobility for the same purpose. Thus began the civil war. After the restoration, the peculiar state of things which had sprung from feudal tenures no longer existed, and the militia was reorganized mainly on its present basis. The king was acknowledged as its sole supreme commander, and no other army was recognized by the law. Lords lieutenant of counties were charged with raising the force, as they had been indeed since the time of Queen Mary; every man who possessed a landed estate of £500 a year, or personal property to the amount of £6,000, was bound to provide, equip, and pay one horseman; every man whose property was one tenth of either of those amounts was charged with one pikeman or musketeer; and smaller proprietors united to furnish a soldier, each contributing according to his means. But it was not until 1757, when a bill to reconstruct the militia was passed, that the force acquired much vitality. The act then passed, though amended several times, is in its main features still in force. The able-bodied men of each parish between the ages of 18 and 35 are enrolled annually, and by ballot a certain required number are to be selected for service. Certain classes are exempted: peers, yeomanry, resident members of universities, clergymen, parish schoolmasters, articulated clerks, apprentices, seafaring men, crown employees, free watermen of the Thames; in England any poor man with more than one child born in wedlock; in Scotland any man with more than two lawful children and not possessed of property to the value of £50; in Ireland any man with more than three lawful children, who pays less than £5 a year rent, or has less than £10 of property. Substitutes may be accepted for the men chosen by ballot, and for many years it has been customary to suspend the ballot, and make up the requisite number by volunteering. The time of service is five years. The command is in the lord lieutenant of the county and his deputies under commission by the crown. The militia are required to assemble for 27 days' training each year, but in time of peace the requirement is not strictly enforced. The mutiny law is applicable while they are under arms. The militia cannot be compelled to march out of their respective counties except in case of invasion or actual rebellion, nor in any case to march out of the kingdom. Their pay while in service is the same as that in the regular army. In 1873-'4 the militia force of the kingdom consisted of 133,952 men and 5,066 commissioned and non-commissioned officers, of whom only about one half appeared on the day of inspection. There are also volunteer organizations consisting of: 1, yeomanry cavalry,

numbering about 15,000; 2, infantry, artillery, &c., including enrolled pensioners, numbering 195,750. These are only liable to be called out in case of actual or apprehended invasion, for service within the kingdom.—In France all able-bodied males are liable to military duty from the age of 20 to that of 40; the first five years in the active army, then four years in the reserve, then five years in the territorial or district army, and then six years in the territorial army of the reserve. Exemptions are made as follows: the eldest of orphans having neither father nor mother; the only or oldest son or grandson of a widow or wife separated from her husband, or of a father more than 70 years old; the elder of two brothers liable to service at the same time; the younger of two brothers when the elder brother is actually in service in the army; the younger son of a family, whose elder brother has died in the service, or been discharged for wounds or illness contracted in the field. There are also partial or conditional exemptions of pupils, teachers, ecclesiastics, &c.; and the local authorities may grant further exemptions, subject to the revision of the military councils, of young men who contribute to the support of their families, and who are engaged in studies or avocations which would suffer from the interruption. (See GUARD, NATIONAL.)—In Switzerland a standing army is forbidden by the constitution. Military instruction is given in the schools, though not made compulsory. The military forces are divided into: 1, the *Bundesauszug*, or federal army, consisting of all able-bodied males between the ages of 20 and 30; 2, the army of the reserve, consisting of all between the ages of 31 and 40 who have served in the first class; 3, the *landwehr*, or militia, embracing all the men from 41 to 45. Their numbers in 1872 were: of the first class, 84,369; of the second, 50,069; of the third, 65,981; total, with the staff added, 201,257. The federal army and the army of the reserve are drilled once a year in their respective cantons, and they also meet once or twice a year in general muster. In Belgium the militia includes all males able to bear arms between the ages of 21 and 40, and they number about 125,000 regular militia and 275,000 reserves. The regular army is supplied by conscription, to which citizens become liable at 19. In the Netherlands the regular army is kept up by conscription of those who have reached the age of 20. The militia consists of those between 25 and 55, who for the first ten years are called active, and afterward the "resting" militia. In Denmark all able-bodied males who have reached 21 are liable to serve eight years in the regular army and afterward eight years in the army of the reserve. The national militia of Sweden is raised and paid by the landowners, assisted to some extent by the income of state domains. The infantry practise a month annually, and the cavalry 45 days.

—The militia system of the German empire is the most complete and effective in the world. Every subject becomes liable to military duty on reaching the age of 20, and he must serve three years in the regular army, and afterward four years in the army of the reserve. After this, at 27, he enters the landwehr or militia, where he remains for five years, liable to be called upon for regular drill, and in case of war to be incorporated in the regular army. Finally, at the age of 32, he is enrolled in the landsturm, where he is subject to military duty within the realm in case of invasion. The reserve, when necessary, are capable of being mobilized for service in two weeks' time. On a war footing the army, according to the latest returns, falls a little short of 1,300,000.—In the Austro-Hungarian monarchy the standing army is formed by conscription of those who have reached the age of 20, and those drawn serve three years in the regular army and seven years in the army of the reserve. The obligation to serve in the landwehr is general, and the period of service is 12 years, but is limited to the respective divisions of the empire from which the body is drawn. There is also the landsturm, corresponding to that of Germany, but enrollment in it is not compulsory except in Tyrol and on the exposed frontier. The army in 1873 numbered on a peace footing 278,470, and on a war footing 838,700.—In Russia all who have reached the age of 21 are liable to conscription for seven years' service in the regular army, and eight years in the reserve. The regular army in 1872 consisted of 765,872 on a peace footing, and 1,213,259 on a war footing. In peace only so many are kept embodied as are necessary to keep the army on the proper peace footing, and the remainder are on furlough. Besides these, the militia is organized whenever emergencies render it necessary. The Cossacks perform military service in lieu of the payment of taxes, and in case of necessity every man from 15 to 60 is liable to serve.—In Italy the regular army is kept up by conscription of those of the age of 21, and those not drawn pass into the army of the reserve, where they practise annually for 40 days, and then are on furlough, subject to be called upon in the event of war. The strength of the army is about 200,000 on a peace footing and 450,000 on a war footing.—In Turkey every man is liable to serve four years in the regular army, and then for two years longer to remain subject to summons for like service; afterward he enters the first reserve for three years, and then the second reserve for three years, after which he passes into the sedentary army, liable to be called out only in time of war. The total available force in time of war is estimated at 700,000.—The militia system of the United States, like that of Great Britain, had its origin in jealousy of standing armies, and the purpose of its establishment was to provide a military force that

should be ready and effective for all sudden emergencies, but only required to serve when the emergency should arise. The constitution of the United States confers upon congress authority to provide for calling forth the militia to execute the laws of the Union, suppress insurrection, and repel invasion, and also to provide for organizing, arming, and disciplining the militia, and for governing such part of them as may be employed in the service of the United States, reserving to the states respectively the appointment of the officers and the authority of training the militia according to the discipline prescribed by congress. It also makes the president commander-in-chief of the militia of the several states when called into the service of the United States. Acting under the provisions of the constitution, the congress of 1792 passed an act for the enrollment in the militia of all able-bodied white male citizens of the age of 18 and under 45, excepting the judicial and executive officers of the federal government, members and officers of congress, custom-house officers and clerks, persons employed in the postal service, inspectors of exports, pilots and mariners, and such persons as should be exempted by state laws. Each person was to be provided with suitable arms and accoutrements, which were made exempt from taxation, and from all process for the collection of debts. The organization was to be effected within one year, under state laws and under officers of state appointment. The act provided that in the organization there should be infantry, cavalry, and artillery in suitable proportions, and designated the number and grade of officers for each division, brigade, regiment, battalion, and company. Another act, passed Feb. 28, 1795, empowered the president, in case of invasion or imminent danger thereof, to call forth the militia of the state or states most convenient to the place of danger or scene of action, as he might judge necessary, and in case of insurrection in any state against the government thereof, on the application of its legislature or of its executive when the legislature could not be convened, to call forth such militia of any other state or states as he might deem necessary to suppress such insurrection. The president was also empowered by the same act, whenever the laws of the United States should be opposed or the execution thereof obstructed in any state by combinations too powerful to be suppressed by the ordinary course of judicial proceedings, or by the marshals, to call forth the militia of such state, or of any other state or states, as might be necessary, to suppress such combinations and cause the laws to be duly executed; and while in service the militia were to be subject to the rules and articles of war, as in case of regular troops. These provisions still remain in force, except that in providing who shall be enrolled the word "white" was stricken out by act of March 2, 1867. The act of 1795 limited the

period of service which the militia might be compelled to perform under such call to three months, but by act of July 29, 1861, when called out to suppress insurrection or assist in enforcement of the laws, it was provided that their continuance in service should not extend beyond 60 days after the commencement of the next regular session of congress, unless congress should expressly by law provide therefor. And the act of July 17, 1862, provided that whenever the president should call forth the militia he might himself fix the period of service, not exceeding nine months. All these acts contemplate that the officering and disciplining of the militia shall be by state authority, and the states have assumed this duty, and made provisions for its discharge. The exemptions from military service under state laws are few, and are confined in the main to members of the executive and legislative departments of the government, judges and clerks of courts, clergymen, teachers, regular physicians and surgeons, superintendents of hospitals, &c., justices of the peace, and active firemen. The state constitutions will be found in general to recognize the value of a well regulated militia in a free government, and to require the passage of laws for organizing, arming, equipping, and disciplining the freemen of the state who are subject to military duty. Every state has laws for that purpose. The governor is the commander-in-chief, and under him are the usual officers, chosen by different modes in different states; in some by the governor alone, in some by the governor with consent of the senate, in some by the legislature, and in some by the persons liable to military duty. For many years it was customary to have annual drill or training days for the whole body of the militia in the several states, and they were called out for the purpose and compelled to attend under penalty; but for 30 years or more the conviction has been spreading that these annual trainings were of little value, and that they accomplished almost nothing in fitting men for active military duty. The consequence has been that the laws providing for them have generally been either repealed or allowed to fall into disuse, and in their place have been substituted provisions under which voluntary organizations are formed, which select their own uniforms and the branch of service to which they will attach themselves, and which are encouraged by small state bounties to perfect their drill and keep themselves in readiness at all times for prompt and effective action. These organizations compose but a small part of the whole body of the militia, but they are ample for all the needs of government in ordinary times, and in extraordinary emergencies they serve as the nucleus of an army until the unorganized militia, or such portion thereof as may be called for, can be put into the field. The militia of the United States at the present time therefore consists of these voluntary organizations, fully officered,

armed, equipped, and drilled, and also all other able-bodied male citizens of the age of 18 and under 45, with the exceptions provided by national and state laws, all of whom are subject to be summoned to perform military duty according to the laws of congress or of their respective states.—The militia has sometimes performed a conspicuous part in the military history of the country, though not always to the satisfaction of those who are disposed to rely upon it as the chief protection of the government. During the revolution the militia of the several states was often called out, but the want of discipline, which could not be adequately supplied during the short periods of their service, rendered them an unsatisfactory reliance. The "whiskey insurrection," as it was called, of 1794, was put down by a levy of militia from Pennsylvania, New Jersey, Maryland, and Virginia. During the war with Great Britain of 1812-'15, the inefficiency of the militia was increased by disputes between the national and state authorities regarding the right of the president to determine finally whether an emergency had arisen which authorized his calling them out, the right to place them under officers of the president's appointment, and the right to march them beyond the limits of the state. The militia of Massachusetts and Connecticut, when called out, were refused payment by the general government because they had not been placed under the orders of the federal officer, and the militia of Vermont were at one time summoned home by the governor because in his opinion no cause existed which justified the president in demanding their services. The judicial decisions were in favor of the right of the president to decide finally and conclusively whether the militia should be summoned (Martin v. Mott, 12 Wheaton, 19); and his right to place them under the command of a federal officer ranking their own officers is now undisputed. On the breaking out of the civil war in 1861, the militia organizations of some of the states proved of the very highest importance, as they enabled a formidable force to be placed in the field much earlier than would otherwise have been possible. The first call of the president for 75,000 men was mainly filled from this source. Afterward volunteers were relied upon in the main, and when the supply from this source proved insufficient, conscription was ordered. As the laws now are, the great majority of all the persons liable to perform military duty in the United States are unlikely to be summoned for discipline, or even to organize for the purpose, unless the military needs shall require a heavy force in the field, in which case, if summoned at all, it will be by conscription.

MILK, the liquid secreted by the mammary glands of female mammals. Its color is generally yellowish white, but sometimes bluish white, and it is quite opaque. Its specific gravity, according to Scherer, varies from 1.018 to

1·045. According to Simon, the average specific gravity of human milk is 1·032. There is a difference of opinion among chemists as to whether normal milk has an acid or an alkaline reaction. According to Berzelius, Peligot, and Lassaigne, it is acid; Simon and others regard it as alkaline, and attribute the acid reaction found by others to its having acquired acidity by standing, or to disease. Numerous examinations, however, seem to indicate that healthy milk may be alkaline, neutral, or acid, according to the food of the animal. D'Arat and Petit say that the milk of stalled animals is always acid, and becomes alkaline only when they are turned out to grass. Hermstädt found milk that had remained long in the udder acid. Fraas had a cow milked six times a day, and found the milk at each time feebly alkaline. After an interval of 24 hours she was again milked, when the first portion of the milk was found alkaline and the last portion acid. The opacity of milk depends upon numerous yellow microscopic globules of a fatty substance from $\frac{1}{10000}$ to $\frac{1}{30000}$ of an inch in diameter, shown in fig. 1. According to Chevreul, cow's butter is composed of stearine, margarine, and oleine, with small

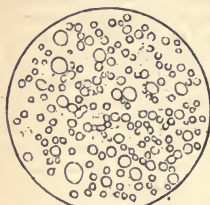


FIG. 1.

quantities of butyric, caproine, and caprine; but late analyses by Heintz and others deny the existence of margarine, saying that it consists of palmitine and a small quantity of stearine, together with small quantities of glycerides, yielding by saponification myristic and butic acids. (See BUTTER.) In regard to the size of the butter globules observers differ. Dr. Carpenter gives their diameter as $\frac{1}{10000}$ to $\frac{1}{30000}$, and Dr. Dunglison adopts this measure. Dr. Dalton says: "The largest of the globules are not over $\frac{1}{30000}$, the greatest number of them being about $\frac{1}{100000}$ of an inch in diameter." According to Dr. Bennett, their diameter varies from $\frac{1}{30000}$ to $\frac{1}{10000}$ of an inch. There has recently been considerable discussion as to the existence of an envelope, or "membrane" as some term it, around the globules. Dr. Von Baumhauer and F. Knapp assert that they have none, and others concur with them. Dr. Bennett and others maintain that either a caseous or an albuminous envelope exists, and experiments are cited as sustaining this opinion. The taste of milk is bland and sweetish, and it has a peculiar animal odor, depending somewhat upon the animal, but perhaps still more upon the food. Garlic, even if the plant is partaken of in very small quantities, is distinctly perceptible by the smell as well as by the taste. Milk has always been an article of man's diet, and forms the entire nourishment of the early existence

of all mammals; and it contains all the elements necessary for the growth of the animal framework.—In comparing milk of the same animal under different conditions of age, health, food, length of time after parturition, &c., as remarkable differences in the proportions of the ingredients will be observed as when samples of the average milk of several different species of mammalia are compared. The following table exhibits the composition of several kinds of milk, the first column presenting the average result of ten analyses by Prof. Poggiale, the next four being furnished by Messrs. Henri and Chevalier in the *Journal de Pharmacie*, vol. xxv., and the last by Dr. Samuel R. Percy of New York as the composition of the milk of a healthy woman. The albumen in these analyses is reckoned with the caseine.

CONSTITUENTS.	Cow.	Ass.	Goat.	Ewe.	Woman.	Woman.
Water.....	86·23	91·65	86·80	85·62	87·93	89·20
Butter.....	4·85	0·11	3·32	4·20	8·35	2·60
Sugar of milk..	5·27	6·03	5·28	5·00	6·30	6·00
Caseine.....	3·80	1·82	4·02	4·50	1·52	2·00
Various salts...	0·27	0·84	0·58	0·63	0·45	0·20
Total.....	100·00	100·00	100·00	100·00	100·00	100·00

An analysis by Völcker is given in the article CHEESE, and also one of the cheese made from the milk. Of these constituents the most uniform in its proportions is the sugar, but this may be materially increased by the use of saccharine food, as is found in feeding cows upon carrots and beets. The sugar of milk is crystallizable, but it is less sweet and less soluble in water than cane sugar. Milk from unhealthy animals often exhibits an increased proportion of phosphate of lime in the ash. When milk is exposed to a warm temperature it ferments, and lactic acid is generated, which has the same ultimate composition as sugar of milk. Under certain conditions the vinous fermentation may now take place, the sugar of milk be converted into grape sugar, and a spirituous liquor be produced, as is practised by the Tartars. (See KUMISS.) Various circumstances affect the quality and composition of milk. That called colostrum, given by the cow immediately after calving, is yellowish, thick, and stringy; for several days it is unfit for use. Examined by the microscope, it is seen to contain numerous large and granular corpuscles. Milk drawn from the cow in the morning is thought to be better than that of the afternoon; and a remarkable difference is perceived in the proportion of cream in the first and last portions of the milking, the latter containing twice as much cream as the same quantity of milk of the former. In the udder of the cow the cream seems to rise as it does when the milk is collected in a vessel.—Some of the methods of testing the quality of milk are noticed under GALACTOMETER. By this the specific gravity is ascertained both of the whole milk and skimmed milk; but as these data are of little value without a knowledge of the proportion of cream,

another instrument, invented by Sir Joseph Banks, and called the lactometer, is used in connection with the galactometer. It is a tube about $\frac{1}{2}$ in. in diameter, and 10 in. of its length graduated in tenths of an inch. When filled with milk, the tube is set aside for 12 hours for the cream to rise. The proportion of this is then read off in the number of divisions occupied by the upper stratum. The thickness of this stratum is very variable with different sorts of genuine milk; but its general range is from 9 to 14 of the divisions, indicating as many percentages. Dr. Hassall thinks the average of pure milk does not exceed $9\frac{1}{2}$ of cream. Dr. Normandy rates it at 8 to $8\frac{1}{2}$. The proportion of cream is also determined by an instrument invented by M. Donné of Paris, called the lactoscope, the principle of which is based upon the opacity of the fluid caused by the buttery particles. A few drops of the milk are introduced between two plates of glass, so set in an ocular tube that they can be brought close together or separated by means of a graduated screw, and thus enclose at their base a thinner or thicker stratum of milk. The observer then looks through the tube at a light set 3 ft. off, and gradually separates the plates of glass, increasing the depth of the layer of milk, till this at last becomes so opaque that the light is lost to view. The figure to which an index on the instrument then points refers to a table, upon which the corresponding quality of the milk as to quantity of cream is designated. As the large globules of cream are the first to rise, if this is removed the remaining skim milk will contain only the smaller globules; and this has been used in Germany as a means of ascertaining whether milk has been skimmed.—Milk is easily adulterated by substituting various cheap materials for the natural ingredients, thereby seriously affecting its quality, while the fraud can be detected only by the skillful examination of the chemist. The nourishing cream is removed and water is substituted. This involves the addition of white thickening substances to disguise the cheat, and of other strange ingredients to restore or retain the sweetness and saltiness of the milk. Large cities are almost hopelessly exposed to these frauds; but worse than all, a large portion of the milk with which they are supplied is that of diseased cows kept in crowded stables and fed with cheap unwholesome food, especially the swill of distilleries. The evil became so serious that several years ago the attention of medical men in New York was directed to the subject, and in 1859 a careful investigation was made into the character and properties of the milk of cows fed upon the swill of distilleries, the results of which are embodied in a report of S. R. Percy, M. D., and published in the "Transactions of the New York Academy of Medicine," vol. ii., part iv. The following are some of the analyses of healthy and diseased milk in that report:

CONSTITU- ENTS.	1.	2.	3.	4.	5.	6.	7.	8.
Water....	85.26	85.86	85.6	87.0	92.4	93.0	87.7	86.9
Butter....	4.40	4.42	4.7	8.5	1.9	1.8	1.9	4.0
Sugar....	8.97	1.79	4.8	1.5	1.0	0.8	1.8	4.2
Caseine....	5.71	7.08	4.8	6.8	8.6	3.4	7.4	4.4
Salts.....	0.66	0.85	0.6	1.2	1.1	1.0	1.7	0.5
Total....	100.00	100.00	100.0	100.0	100.0	100.0	100.0	100.0

No. 1 is the milk of a cow kept for family use in New York; No. 2, of swill-fed cows from distillery stables in New York; both the analyses are by Dr. Doremus. The following are by Dr. Percy: No. 3, country milk furnished by a dealer to customers in New York; No. 4, milk as drawn from the cows in a Brooklyn distillery stable; No. 5, sample of same delivered to customers; No. 6, another sample of the same as sold to customers; No. 7, milk from a sick cow, Brooklyn distillery stables; No. 8, sample of the milk used by Gail Borden for preparing the "condensed milk." Healthy milk was observed by Dr. Percy to have an alkaline reaction, while that from diseased animals was always acid. The same observation had been made by Gay-Lussac, Berzelius, and others; and the effect is found to be induced in a short time in animals shut out from the light of day, and in those confined in bad air and supplied with bad food. In the analyses, the bad milk is at once recognized by its unduly large proportion of caseine, while the sugar and often the butter is as disproportionately small. The large amount of saline matter found in bad milk is caused by the addition of salt made for the purpose of disguising the adulteration with water. But the proportions of the ingredients, though sufficient to expose the character of the milk, cannot indicate the poisonous qualities of the worst sorts, nor the evil effects that may follow their use. In organic compounds, such as we use for food, as in the air we breathe, the most dangerous poisons may lie concealed beyond the power of detection of the most delicate tests or the most powerful microscopes, and their existence is brought to light only by their effects upon the human system. Thus the real nature of the distillery milk is most properly shown in the report by citation of several cases of disease in young children traced directly to its use.—Milk may be impure from natural as well as artificial causes. The microscope affords a pretty good test in both cases, starch granules and chalky particles being easily detected, the latter especially on the addition of a little acid. The simplest cases of diseased milk are those caused by feverishness in the cow. This causes the globules to assemble in groups, as if they possessed a certain degree of vitality somewhat resembling that of blood globules. Fig. 2 shows the microscopic appearance of the globules in feverish milk. Fig. 3 gives the appearance of a sample of milk from a distillery stable in Brooklyn, examined by Dr. Percy. It was taken from a cow very ill

with high fever and inflammation of the bowels. The milk was scanty and blue, and contained, in addition to the broken-down butter

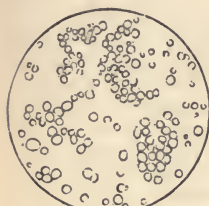


FIG. 2.



FIG. 3.

globules and spores of confervæ, blood globules which are not shown in the drawing. Fig. 4 is a sample of the same milk after standing

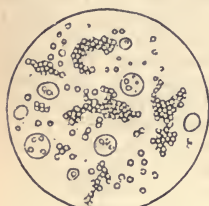


FIG. 4.

closely corked for 24 hours. The spores of confervæ have grown to perfect plants, with branching stems. These drawings were given in the "Report of the New York State Medical Society" for 1860.—Prof. James Law of Cornell university has made some investigations in relation to fungi in

cows' milk, of much practical interest. He arrived at the conclusion that several of the low forms of vegetable life were introduced into the water of which the cows drank, as he found the same forms in the water and also in the blood of the animals. The experiments were made in such a manner as to preclude the possibility of the introduction of the organisms from any other source. The details are given in a pamphlet reprinted from the "Lens," and also in an address on poison cheese before the American dairyman's association in 1872 by L. B. Arnold of Ithaca, N. Y. Prof. Gerlach of Hanover has recently made a series of investigations in regard to the effect of a diet of milk from tuberculous cows, which would lead to the conclusion that tuberculosis may be transmitted in this manner from the bovine to the human race. The subject is at the present time undergoing examination in this country, but no conclusive results have yet (January, 1875) been arrived at.—The preservation of milk from putrefaction is an object of no little importance. In France this is accomplished by causing the solid portion of the milk to combine with other matters, and thus separate in a solid form from the aqueous portion; but the compound is not properly milk. It is also evaporated down to the consistency of sirup, and then by the addition of sugar made into a solid compound of milk and sugar; and by a third method it is preserved by expelling the air from it, and hermetically sealing the bottles

while they are under a steam heat of about 100° C. In this way milk has been preserved perfectly fresh for 5½ years. In the United States a patent was granted in 1856 to Gail Borden, jr., for another method, which he successfully conducted in Litchfield co., Conn., and afterward in Texas, supplying what is called "condensed milk" to consumers throughout the country. By his process the milk when drawn from the cow is immediately cooled to about 60° F., in order to check its changing. It is soon after rapidly heated in a vat surrounded with hot water to 180° or 190°, when refined white sugar is added in the proportion of about one part to nine of milk. It is kept in the hot water vat about 30 minutes after adding the sugar, and is then removed to vacuum pans in which evaporation of the water is effected at a temperature not exceeding 160°. When it is sufficiently concentrated, the pans are quickly cooled down by passing cold water in the place of steam through the heating pipes. The milk, converted into a paste, can then be removed from the pans without adhering to their sides. Another preparation, known as "solidified milk," is also made by a process like one of the French methods above referred to. To 112 lbs. of fresh milk 28 lbs. of sugar are added, together with a teaspoonful of bicarbonate of soda, merely enough to neutralize any slight acidity. The mixture is then evaporated by the heat of a water bath carefully regulated, and the process is hastened by a current of air made to pass over the surface. An apparatus is kept in operation gently stirring the mixture during the evaporating process, until at last the milk and sugar are reduced to a creamy-looking powder. This when cooled in the air is weighed out into pound parcels, and compressed by machinery into the shape and size of small bricks. These, covered with tin foil, are ready for sale, and are well adapted either for preservation during long voyages or for immediate domestic use. The preparation of condensed milk is conducted upon a large scale in Switzerland.

MILK, Sugar of, or Lactine, one of the constituents of milk. It is prepared in Switzerland as an article of food, and is used by homœopaths as the vehicle for their medicines, and in other practice as an article of food for infants in teething, being less apt to produce acidity than cane sugar. It is also recommended as a non-nitrogenous article of diet in pulmonary diseases. It is prepared from the whey obtained from milk coagulated with a little dilute sulphuric acid, and left several weeks in a cool place to crystallize. The crystals of sugar of milk are collected and decolorized by animal charcoal and repeated crystallizations. They consist of $C_{12}H_{22}O_{11} + 5H_2O$. They are hard and gritty, rather insoluble in water and alcohol, slightly sweet, and not easily fermentable. When converted into grape sugar by the action of dilute acids, sugar of milk may furnish a spirituous liquor, as noticed in the

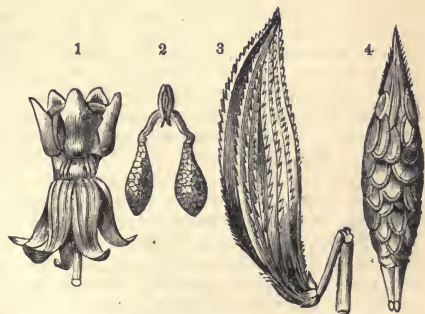
article MILK. By the homœopaths sugar of milk is regarded as the substance most inert upon the system, and for this reason as well as on account of its great hardness, which causes it to reduce to extreme fineness the substances with which it is ground, they esteem it as the best medium for their medicines, and are by far the largest consumers of it.

MILK LEG, or *Phlegmasia Dolens*, an obstruction of the veins and lymphatics, causing a painful, non-œdematous swelling in one or both lower extremities. It is most common in women after parturition, but it sometimes occurs in unmarried women, and sometimes in males. In the case of lying-in women it usually commences about a week or ten days after delivery, but may take place immediately after labor, or at any time during the next five or six weeks. Any great drain upon the system is liable to be followed by rapid absorption, by which morbid matter contained in the uterus may be taken into the contiguous veins. The pathology consists in inflammation and obstruction of the iliac and femoral veins. The symptoms attending the condition are fever, headache, thirst, nausea, and pain, especially in the lower abdominal and pelvic regions, attended by extreme prostration. The attack may commence with a chill, and within 24 or 36 hours the foot or lower part of the leg may begin to swell, the process extending upward. The acute stage lasts about two or three weeks, and after recovery many deep veins remain obliterated, while the more superficial ones become enlarged and tortuous. The limbs usually remain useless for many months, and often never recover their former condition. As the disease is attended with feebleness, the application of leeches and other forms of blood-letting are generally inadmissible. The most rational treatment is the administration of tonics and diffusive stimulants, combined with alkaline medicines, a bland and nourishing diet (wine and eggs, beef tea, &c.), with the external application of liniments and emollient and alkaline applications, such as soap liniment, bran poultice, and solution of bicarbonate of soda or ammonia.

MILK TREE. See COW TREE.

MILKWEED, the popular name for plants of the genus *Asclepias* (named in honor of Æsculapius), which includes about 40 species, half of which are North American and the remainder natives of Central and South America. They are all herbaceous plants, with thick deep roots, and mostly with a copious milky juice, bearing their flowers in simple umbels. Few plants present flowers in which the ordinary floral structure is so obscure, and it is not easy to explain them without numerous elaborate diagrams; in general terms it may be said that the parts of the flower are in fives; the five-parted calyx is persistent; the deeply five-parted corolla is reflexed; immediately within the corolla is a curious structure called the crown, made up of appendages to the stamens,

which are themselves united into a tube by their filaments; behind each anther is borne a curious erect hood-like appendage, from which projects a small horn; these appendages are petal-like, and together form a conspicuous portion of the flower; the anthers closely surround and partially adhere to the broad stigma; each anther cell contains a pear-shaped, waxy mass of pollen, and two adjacent masses from two contiguous anthers are suspended by a stalk from a blackish adhesive gland which is borne on the margin of the broad stigma; these pollen masses, by means of the adhesive glands, stick to insects which visit the flowers for honey, and are thus dislodged and borne to other flowers; bees are frequently quite disabled by these pollen masses, which adhere to their legs in such numbers as to prevent them from climbing upon their combs, and they fall down and perish. The ovaries are two, ripening into two large follicles, which open and expose the flattened seeds imbricated over a large placenta, each furnished with a tuft of long, beautiful silky hairs, by the aid of which it may be wafted to a distance by the wind; on account of these silky hairs the plant is frequently called silkweed. The flowers in most species are showy and fragrant, and some are cultivated as ornamental plants; the young shoots of our common species are valued by many as a substitute for asparagus; the bark of their stems is very tenacious, and various partially successful attempts have been made to obtain from them a textile fibre and a paper stock; the plants are not abundant enough in the wild state to afford any considerable supply, and no experiments have been made to ascertain whether their cultivation as a fibre-producing plant would be profitable. The beauty of the silky down of the seeds early



Common Milkweed (*Asclepias Cornuti*).—1. Flower. 2. Pollen Masses. 3. Pod. 4. Seeds imbricated on the placenta.

attracted attention, and many attempts have been made to utilize it; but the hairs are very weak and brittle, and without the roughness or angularity which makes it possible to spin other fibres; when mixed with cotton it has been spun and woven into fabrics which have a silky

lustre and take brilliant dyes, but the manufacture has not been prosecuted; the principal use made of the down is in the stuffing of pillows.—The common milkweed (*A. Cornuti*) is the most abundant species, and is to be found in rich grounds almost everywhere; although it is a native of America, Linnæus called it *A. Syriaca*, a name which has been properly superseded; in the southern states it is known as Virginia swallow wort and Virginian silk. The purple milkweed (*A. purpurascens*) is a dark-flowered species; *A. variegata* has nearly



Variegated Milkweed (*Asepias variegata*).

white flowers; *A. incarnata*, with fine rose-purple flowers, is very common in wet grounds, and is known as the swamp milkweed; the blunt-leaved milkweed (*A. obtusifolia*) is a common species, readily recognized by its clasping, sessile leaves, and its single umbel of large but dull-colored flowers; the four-leaved milkweed, the most delicate of the genus, blooms in woods in June, and is well marked by having one or two whorls of four leaves; *A. verticillata*, very common on dry hills, has whorled leaves, which are so narrow as to give the plant a very different aspect from other species. The most showy of all our native milkweeds is *A. tuberosa*, more generally called butterfly weed and pleurisy root; it is quite common, especially southward; the root is large, fleshy, and white; the stems are more or less decumbent and roughly hairy, very leafy, and branching at the summit, where it bears numerous umbels of bright orange-colored flowers, which are exceedingly showy and allow the plant to be distinguished at a great distance; in this species the juice is scarcely milky. As one of its popular names indicates, the plant is used in medicine, the root being the official portion; its action is diaphoretic and expectorant without being stimulant, and in large doses is purgative. This plant is much valued abroad as an ornamental one, and its roots are a part of the regular stock of the

growers of bulbs and tubers; in this country it is seldom seen in gardens, but there is no flower of its color capable of producing a more brilliant effect. Several of our common species are valued in European gardens, as is *A. Douglasii*, a conspicuous plant from California, with large leaves, very white with woolly hairs, and large lilac-purple fragrant flowers. *A. Curassavica*, from South America, naturalized in Florida, with flowers of orange scarlet, is a common greenhouse plant, and is frequently set out in the border for summer blooming; this has emetic properties, and is used in the West Indies under the incorrect name of ipecacuanha. Active properties pervade the genus, and several of the species have a reputation among the herb doctors.—The genus is the typical one of the *Asepiadaceæ*, which includes more than 130 genera and over 1,000 species. Of the other native genera, the green milkweeds, of the genus *acerates*, differ from the true milkweeds in the absence of a horn to the staminal hood. A twining plant, *vinetozium nigrum*, with very dark purple flowers, has escaped from cultivation in some places, as has the Grecian silk, *periploca Græca*, which is often seen in gardens as an ornamental climber. From Pennsylvania southward are found several species of *gonolobus*, which are twining herbs of little beauty. Among cultivated exotics of this family are the wax plants (*Hoya carnosa* and other species), with fleshy oval leaves and umbels of beautiful but artificial-looking flowers; *Stephanotis floribunda*, one of the most valued greenhouse climbers, with fine foliage and pure white fragrant flowers; and the singular stapelias, with cactus-like stems and lurid flowers with the odor of carrion.

MILKY WAY. See GALAXY.

MILL. I. James, a British philosopher, born in Logie Pert, near Montrose, Forfarshire, April 6, 1773, died in Kensington, June 23, 1836. He was educated at the grammar school of Montrose and the university of Edinburgh, where he excelled in Greek and metaphysics. He was licensed to preach in 1798, but abandoned the profession, removed to London in 1800, became editor of the "Literary Journal," which was soon discontinued, and was an occasional contributor to the principal British reviews. He soon attracted the notice of Jeremy Bentham, was for several years domesticated in his house, and was the chief expositor of his opinions in England. On the establishment of the "Westminster Review" in 1824 by Bentham, Mill became one of its principal contributors, writing for it important articles on the "Formation of Opinions," the "Ballot," "Aristocracy," and other subjects. For ten years much of his time was occupied in writing his "History of British India" (3 vols. 4to, 1817-'18; continued to 1835 by Prof. H. H. Wilson, 9 vols. 8vo, 1840-'46). It was without a rival as a source of information; and though he censured the conduct of the East India company, his ability and familiarity with its affairs

caused the directors in 1819 to introduce him into their home establishment, where he managed their correspondence with India in the revenue branch of the administration; and he became in time head of the department of Indian correspondence. His official duties did not preclude the continuance of his labors as an author, and he contributed to the supplement to the earlier editions of the "Encyclopædia Britannica." His articles on colonies, education, government, jurisprudence, law of nations, liberty of the press, and prison discipline were reprinted in a volume (1828), and are among his most effective writings. His "Elements of Political Economy" (1821-'2) presented the views of Ricardo in a precise and clear style. His most elaborate work is his "Analysis of the Phenomena of the Human Mind" (2 vols. 8vo, 1829), an ingenious exposition of the sensational philosophy. His last publication was a fragment containing a severe criticism on Sir James Mackintosh's dissertation on the progress of ethical philosophy (1835). II. John Stuart, an English philosopher, son of the preceding, born in London, May 20, 1806, died in Avignon, France, May 9, 1873. He was educated by his father in a singularly pedantic manner, and for many years subjected himself to the severest intellectual training, while pursuing a wide range of studies. In 1823 he became a clerk in the India house, in which after a series of promotions he received in 1856 the appointment of examiner of Indian correspondence, a post which had been held by his father, and which he retained till the extinction of the East India company in 1858. He was selected to edit Bentham's "Rationale of Judicial Evidence" (1827), to which he added notes and supplementary chapters. He was a frequent contributor to the journals in favor of advanced liberal views during the agitation of the reform bill. In the "London and Westminster Review," which he conducted from 1834 to 1840, appeared his masterly articles on Bentham and Coleridge, in which his aim was to interpret between their respective admirers, criticizing his own party and reporting truths which it might learn from its opponents. He also wrote for the "Edinburgh Review" and other leading periodicals. He first became widely known by the publication of his "System of Logic, Ratiocinative and Inductive" (2 vols., 1843), in which the whole character of his philosophy appears. The predominance which he gives to sensation in psychology involves the predominance of induction in logic. He denies the existence of *a priori* truths, affirms that knowledge is limited to phenomena, and ignores causation beyond phenomenal conditions. His "Essays on some Unsettled Questions of Political Economy" (1844) was preliminary to his second great work, entitled "Principles of Political Economy, with some of their Applications to Social Philosophy" (1848), a subject peculiarly fitted to his adroit-

ness in the treatment of positive problems and palpable interests. He aimed, like Adam Smith, to associate the exposition of general principles with their practical applications, and also to introduce the new ideas, especially respecting currency, foreign trade, and colonization, which had been elicited by discussions subsequent to the publication of the "Wealth of Nations;" to maintain a course of strict scientific reasoning while exhibiting the economical phenomena of society in their relation to the best social ideas of the present time. His "Dissertations and Discussions, Political, Philosophical, and Historical," collected chiefly from the "Edinburgh" and "Westminster" reviews (2 vols., 1859; vol. iii., 1867; vol. iv. in preparation, 1874), embrace his views on the most important topics. He maintains that scientific certainty is only relative, and that theology can have no firmer basis than an inference from the analogies of experience; that morality is but a means to an end, which is happiness, that approximation to an ideal standard of inward harmony is the method of attaining that end, that the realization of this harmony is not a moral but an æsthetical achievement, and that the utilitarian is entirely different from the selfish view of life; that poetry, music, painting, and sculpture have great social value and educative power; that political questions should be decided by the deliberately formed opinions of a select few, specially educated for the task, whose rectitude of purpose should be secured by rendering them responsible to the many; that the ideal of a rational democracy is not that the people themselves govern, but that they have security for good government; that there is no essential difference between the powers of woman and man, and that she should be his partner in all actual and intellectual enterprises, and in all social and political privileges and responsibilities; and that all history is a progressive chain of causes and effects, the complex facts of each generation being caused by that which preceded it, and moulding that which follows it. He published also in 1859 a work "On Liberty," the object of which is to show that our age manifests an increasing despotism of social and political masses over the moral and intellectual freedom of individuals, that the supremacy of public opinion discourages the strength or intensity of any well marked type of character, that energetic characters on any large scale are becoming merely traditional, and that the only guarantee against the decline of our civilization is to erect by common consent every individual human mind into an impregnable and independent fortress, within which no social authority shall have any jurisdiction. In his "Thoughts on Parliamentary Reform" (1859) he recommends the extension of the electoral suffrage to all householders without distinction of sex, on condition of proving their ability to read, write, and calculate, and a considerable extension to persons

of certain educational qualifications; advocates cumulative voting; and opposes the use of the ballot. His later works are: "Considerations on Representative Government" (1861); "Utilitarianism" (1862); "Auguste Comte and Positivism" (1865); "Examination of Sir William Hamilton's Philosophy" (1865); "England and Ireland" (1868); "The Subjection of Women" (1869); "Chapters and Speeches on the Irish Land Question" (1870); and "Autobiography" (posthumous, 1873; German translation by Karl Kolb, Stuttgart, 1874). In 1865 Mr. Mill was elected to parliament from Westminster, and acted with the advanced liberals. In 1867 he presented a petition for woman suffrage, and moved an amendment to the reform bill striking out the words limiting the electoral franchise to males. In 1868 he lost his seat. He was chosen rector of the university of St. Andrews in 1867, and his inaugural address was published in the same year. His posthumous "Three Essays on Religion: Nature, the Utility of Religion, Theism," appeared in 1874. —See "John Stuart Mill: His Life and Works" (1873), 12 sketches by J. R. Fox Bourne, W. T. Thornton, Herbert Spencer, and others.

MILL, John, an English scholar, born at Shapp, Westmoreland, about 1645, died in Oxford, June 23, 1707. He graduated at Oxford in 1669, where, after receiving various ecclesiastical preferments, he was made in 1685 principal of St. Edmund's hall. He became prebendary of Canterbury in 1704. His most important work is his edition of the Greek Testament, to the preparation of which he devoted the last 30 years of his life. It was undertaken at the suggestion and expense of Dr. Fell, bishop of Oxford; but after that dignitary's death Mill continued it at his own cost, and paid back to Fell's executors the money advanced. He finished the work only 14 days before his death, and it was published the same year. It adopts the received text of Robert Stephens, and contains over 30,000 various readings collected from the works of former commentators, the writings of the fathers, and ancient uncollected manuscripts.

MILLAIS, John Everett, an English painter, born in Southampton, June 8, 1829. When nine years old he gained a medal from the society of arts, and was placed in Mr. Sass's preparatory school of art in London, whence at the age of 11 he was transferred to the antique school of the royal academy. In 1848 he gained the medal for drawing from the antique. In 1846 he exhibited his first picture at the academy, "Pizarro seizing the Inca of Peru," and in 1847 obtained the gold medal for the best oil picture, his subject being "The Tribe of Benjamin seizing the Daughters of Shiloh." At this period he was induced to reject the academic rules which then prevailed, and to adopt the principles of the "Pre-Raphaelite school," of which he was one of the original members. The first picture painted by him in the new style was "Isabella," from

Keats's poem, exhibited in 1849. In 1850 appeared his "Ferdinand lured by Ariel," and a mystical picture of Christ, and in 1851 "Marina in the Moated Grange," "The Return of the Dove to the Ark," and "The Woodman's Daughter." So rigorously did he follow the realistic principles involved in his new conceptions of art, that the simplicity at which he aimed was deemed as an evidence of baldness and poverty, and his pictures were declared to be utterly deficient in the sense of beauty. But their unquestioned power challenged attention, and it was conceded that the naturalism which the artist sought to embody in his works was of a higher order than the literal reproduction of nature. His efforts at religious symbolism found few admirers, and were not repeated. "The Huguenot" and "Ophelia," exhibited in 1852, increased his reputation; and in the succeeding year his "Proscribed Royalist" and "Order of Release." Some of his later works are: "A Dream of the Past: Sir Isumbrus at the Ford" (1857); "The Heretic" (1858); "Vale of Rest" and "Spring Flowers" (1860); "The Black Brunswicker" (1861); "My First Sermon" (1863); "Charley is my Darling" (1864); "Joan of Arc" and "The Romans leaving Britain" (1865); "Sleeping," "Waking," and "Jephthah" (1867); and "Winter Fuel" (1874). Millais was a contributor to the "Germ" (1850), a short-lived periodical, devoted to an exposition of the views of the pre-Raphaelites. He has sometimes been engaged in the illustration of books and periodicals. In 1863 he was elected a member of the royal academy, having been an associate since 1853. He married the former wife of John Ruskin, who had procured a divorce in Scotland.

MILLARD, a W. county of Utah, bordering on Nevada; area, 6,000 sq. m.; pop. in 1870, 2,753. It contains Sevier lake, and is intersected by Sevier river. The W. part is mostly unexplored. The settlements are in the E. part, in the valleys along the W. base of the Wasatch mountains. Valuable minerals are supposed to exist. The chief productions in 1870 were 29,267 bushels of wheat, 6,853 of Indian corn, 9,714 of potatoes, 4,038 lbs. of wool, 23,437 of butter, 14,325 of cheese, and 909 tons of hay. There were 1,555 horses, 2,041 milch cows, 2,915 other cattle, 3,722 sheep, and 151 swine. Capital, Fillmore City.

MILLARD, David, an American clergyman, born in Ballston, N. Y., Nov. 24, 1794, died in Jackson, Mich., Aug. 3, 1873. He was brought up a farmer, but became a teacher when 17 years old. In 1815 he entered the ministry of the Christian denomination, and from 1818 to 1832 was pastor in West Bloomfield, N. Y., where he wrote "The True Messiah in Scripture Light" (1818). He also edited for several years a monthly magazine called the "Gospel Luminary." In 1837-'40 he was pastor in Portsmouth, N. H. In 1841 he visited the Mediterranean and the East, and in 1843 pub-

lished "Travels in Egypt, Arabia Petrea, and the Holy Land." On his return he settled again at West Bloomfield, made frequent lecturing tours, and from 1845 to 1867 was professor of Biblical antiquities and sacred geography in the Meadville theological seminary. His life has been written by his son, the Rev. D. E. Millard (1874).

MILLAU, *Milland*, or *Milbau*, a town of Languedoc, France, in the department of Aveyron, on the Tarn, 85 m. N. E. of Toulouse; pop. in 1866, 13,663. It has a communal college and a chamber of commerce. The chief manufactures are woollen cloth, leather, gloves, and silk twist. A brisk trade is carried on in timber, cattle, wool, wine, and other agricultural products. In the religious wars of France the town became famous as one of the strongholds of the Huguenots, and in 1629 its ancient castle and the walls were demolished by Louis XIII.

MILLEDGE, *John*, an American soldier and statesman, born in Savannah, Ga., in 1757, died at the Sandhills, near Augusta, Feb. 9, 1818. He was one of the party which captured Gov. Wright (June 17, 1775), the first bold revolutionary act performed in Georgia. He was at the unsuccessful siege of Savannah under the count D'Estaing and Gen. Lincoln, and also at the siege of Augusta. In 1780 he was appointed attorney general, and he served frequently in the state legislature. In 1802 he was elected governor of Georgia, and served two terms. He was a representative in congress from 1792 to 1802, except one term, and United States senator from 1806 to 1809. He was the principal founder of the university of Georgia.

MILLEDGEVILLE, a town and the county seat of Baldwin co., Georgia, and formerly capital of the state, on the W. bank of the Oconee river, at the intersection of the Macon and Augusta and the Milledgeville and Eatonton railroads, 85 m. S. E. of Atlanta, and 145 m. W. N. W. of Savannah; pop. in 1870, 2,750, of whom 1,547 were colored. It is surrounded by a beautiful and fertile cotton region, and contains several handsome residences. The governor's mansion and the state house are in good preservation, and are still the property of the state. Two weekly newspapers are published. It is the seat of the state lunatic asylum and of the state penitentiary. Milledgeville was entered by the forces of Gen. Sherman on Nov. 23, 1864, who burned the magazines, penitentiary, arsenals, depot buildings, bridges, and about 1,700 bales of cotton. The capital was removed to Atlanta in 1868.

MILEDOLER, *Philip*, an American clergyman, born at Rhinebeck, N. Y., Sept. 22, 1775, died on Staten Island, Sept. 23, 1852. His father, a Swiss, came to America about 1751. The son graduated at Columbia college in 1793, studied theology, and in 1795 became pastor of the German Reformed church in Nassau street, New York, where he preached both in German and English. In May, 1800, he

became one of the pastors of the collegiate Dutch Reformed church in New York, but soon after accepted the pastorate of the Pine street Presbyterian church in Philadelphia. In 1801 he was elected secretary of the board of trustees of the Presbyterian church. In 1805 he accepted a call from the then collegiate Presbyterian churches in New York, with special reference to the church in Rutgers street, where he was installed on Nov. 19. In 1813 he became pastor of the collegiate Dutch church in New York. In 1825 he was appointed professor of didactic and polemic theology in the seminary at New Brunswick, N. J., and at the same time president of Rutgers college, both which offices he retained till 1835. His last residence was in New York. He published many sermons and addresses, and a "Dissertation on Incestuous Marriages" (1843).

MILLE LACS, an E. central county of Minnesota, drained by Rum river, and containing the S. portion of Lake Mille Lacs; area, 684 sq. m.; pop. in 1870, 1,109. The surface consists of rolling prairies, with timbered bottom lands along the streams. The chief productions in 1870 were 7,920 bushels of wheat, 9,572 of Indian corn, 9,131 of oats, 5,163 of potatoes, 22,667 lbs. of butter, and 1,917 tons of hay. Value of live stock, \$33,869. There were 2 saw mills and 1 flour mill. Capital, Princeton.

MILLENNIUM (Lat. *millē*, 1,000, and *annus*, a year), a period of 1,000 years. In theology this term generally designates the doctrine of a return of Jesus Christ in person before the end of the world, of a first or particular resurrection of the just, who are to reign with Christ on earth, and of the destruction of Antichrist. Those who hold such views are called millenarians or chiliasts (Gr. *χίλιας*, a thousand). It is admitted on all sides that millenarian views were, if not general, at least very common in the ancient church. The belief was generally founded on Ps. xc. 4 and 2 Pet. iii. 8, according to which a thousand years are before the Lord as one day, compared with the account of the creation as given by Moses, the six days of creation being taken as designating 6,000 years of toil, and the subsequent sabbath 1,000 years of rest and happiness. Rev. xx. 1-6 is especially quoted by millenarians in support of their views. Millenarianism prevailed chiefly among the Jewish Christians, who retained after their conversion the hope of the Jewish nation that they would rule over all other nations under a royal Messiah. The Ebionites, the Nazareans, and the Cerinthians all strongly advocated it; and Montanus and his followers regarded it as a fundamental doctrine of the Christian religion. The early fathers of the church also declared themselves generally in favor of the doctrine; Papias, Justin, Irenæus, and Tertullian all clearly teach it; and Papias appealed in support of his view to apostolic traditions. The epistles of Clement of Rome and Ignatius of Antioch, and the epistle to Diognetus, are silent about it. Justin, though

himself a believer in the millennium, knew many orthodox Christians who were not; yet none of the apostolic fathers openly opposed it. The first opponent of whom we know was the Roman presbyter Caius, who designated the doctrine as an invention of the arch-heretic Cerinthus. Origen first gave a more rational idea of the millennium, which according to him would consist in the reign of Christian truth throughout the world, and in the voluntary submission paid to it by all secular powers. This view was upheld by the Alexandrine school. Still the old view continued to find advocates during the 3d century, among whom Tertullian, Nepos, bishop of Arsinoë, and Methodius, bishop of Tyre, were prominent. In the 4th century, though it had still many adherents among the people, it found no longer any advocate of note among the Christian writers; yet Jerome, who did not believe in it himself, did not dare to condemn it. From the 5th century millenarianism began to die out. It was temporarily revived, toward the close of the 10th century, by the popular belief in the approaching end of the world, and at later periods by the abbot Joachim de Floris, the Spirituals, the Apostolic Order, Peter de Oliva, and other heretics of the middle ages; but it never regained great strength.—The reformation of the 16th century gave a new impulse to millenarian views. Common opinion identified the pope with Antichrist, and regarded the expected downfall of papacy as foreshadowing the approach of the millennium. But when the Anabaptists assumed about 1534 to erect the new Zion, both the Lutheran and Reformed churches declared themselves against this caricature of the old Christian doctrine. Yet it was preached with enthusiasm by many sects and theologians of the 16th and 17th centuries, among whom were Weigel and the Moravian bishop Comenius in Germany, Jurien in France, the Labadists in the Netherlands, and Joseph Mede and Jane Lead (died 1704) in England.—Johann Albrecht Bengel reintroduced millenarianism into Protestant theology, where it has ever since been advocated by many prominent theologians. The ingenious prelate Oetinger (died 1782) brought it into connection with his favorite theosophic views. Hahn (founder of a pietistic sect in Wurtemberg), Stilling, Lavater, and Hass gave it a wide circulation among the lower classes of the people in Germany and Switzerland. With Rothe (*Theologische Ethik*, vol. ii.) millenarianism forms an organic link in his theosophic system. In opposition to the "spiritualism" of modern exegesis, it has been advocated, with exegetical arguments, by Hoffmann, Delitzsch, Kurtz, Hebart, and others; while Thiersch, Nitzsch, P. Lange, and Ebrard supported it from a dogmatical as well as an exegetical standpoint. Swedenborg taught that the last judgment took place in 1757, and that the New church or church of the New Jerusalem had actually been formed both in heaven

and on earth. After Germany, England and America have been the chief fields of modern chiliasm. The "Catholic Apostolic Church," organized by Edward Irving, laid great stress on the belief that the kingdom of glory was very near. Millenarian views lie at the foundation of Mormonism, the people who hold that belief calling themselves "Latter Day Saints" in reference to the near approach of the last day. The sect commonly called Shakers style themselves the "Millennial Church." In the United States a great agitation was called forth by the preaching of William Miller, who sought to prove from the Scriptures that the second advent of Christ would occur about 1843. He not only found numerous believers in most denominations, but also occasioned the organization of a new denomination of Adventists. One of the most noted of recent millenarians is the Englishman Dr. John Cumming, who placed the end of the "present dispensation" in 1866 or 1867, and then in 1868. In November, 1870, he published "The Seventh Vial," to prove that all the prophecies concerning the millennium have been fulfilled.—Millenarian views in various periods of the Christian church differ widely respecting most points, except the duration of the millennium, which nearly all of them fix at 1,000 years. The beginning of the millennium was fixed by Hippolytus at the year 500, by Jurieu at 1785, by Bengel at 1836, and by others at other dates. Many agree in expecting it between 1879 and 1887. Commonly the earth is believed to be the only place of the millennium, and Jerusalem its central point of union. Many still hold the view of Origen (see above), and of Martensen (*Christliche Dogmatik*, 1850), that it denotes the period of highest earthly prosperity of the church in the spiritual return of Christ to the earth.—A good history of millenarianism in the Christian church is still a desideratum, as the works published do not exhaust the subject. See Corrodi, *Kritische Geschichte des Chiliasmus* (Frankfort, 1781); and D. T. Taylor, "The Voice of the Church on the Coming and Kingdom of the Redeemer: a History of the Doctrine of the Reign of Christ upon Earth," revised by Hastings (2d ed., Peacedale, R. I., 1855).

MILLEPEDE. See CENTIPEDE.

MILLEPORA (*millepora*, Linn.), a genus of hydroid medusæ. The animals live in communities, which take on various arborescent and incrusting shapes; they deposit much carbonate of lime in their tissues, so that the medusa stock is in outward appearance almost solid, with minute pores on the surface which contain the animals. A cross section of this stony skeleton shows that the minute individuals of the community constantly grow outward in the direction of their longitudinal axis, forming as they proceed long calcareous tubes, which are so intimately cemented together as to make a compact mass. Across these tubes, at short intervals, are formed little transverse

platforms, which divide the tubes into joints or cells. These platforms are deposited by the base of the animal, and are of high importance in classification; by them is characterized Milne-Edwards's division of the *tabulata*, which includes *millepora*. Till within a short time



Millepora alaicornis.

all zoölogists have placed the millepores among polyps. In the winter of 1857-8 Prof. Agassiz succeeded, for the first time, in observing the animals of *millepora alaicornis* in Florida, and was surprised to find them not polyps, but true hydroid medusæ, resembling *hydractinia*. This observation gives great importance to the medusæ, as represented among the fossils, for the *tabulata* are found abundantly as low as the Silurian formations. As the presence of mesenteric septa seems to militate against the above mentioned separation, some naturalists retain them among the polyps.—See "The British Fossil Corals," by Milne-Edwards, in the "Transactions of the Palæontographical Society;" Dana's "Zoöphytes" and "Corals and Coral Islands;" the "American Journal of Science," vol. xxvi., p. 140 (1858); and Agassiz's "Contributions to the Natural History of the United States," vol. iii.

MILLER. I. A S. W. county of Georgia, intersected by Spring creek, a branch of Flint river; area, about 250 sq. m.; pop. in 1870, 3,091, of whom 956 were colored. The surface is level, and the soil moderately fertile. The chief productions in 1870 were 76,783 bushels of Indian corn, 11,968 of oats, 13,867 of sweet potatoes, 1,744 lbs. of rice, 6,015 of wool, 11,370 of butter, 1,684 bales of cotton, and 10,993 gallons of molasses. There were 1,871 milch cows, 4,110 other cattle, 3,995 sheep, and 6,456 swine. Capital, Colquit. II. A central county of Missouri, traversed by Osage river, here navigable during three or four months of the year; area, 570 sq. m.; pop. in 1870, 6,616, of whom 176 were colored. The surface is diversified and well timbered with walnut, sugar maple, and other valuable woods. The soil of the river bottoms is fertile. The

chief productions in 1870 were 91,918 bushels of wheat, 256,141 of Indian corn, 69,977 of oats, 12,475 of potatoes, 10,436 lbs. of tobacco, 22,482 of wool, 31,773 of butter, and 1,567 bales of cotton. There were 2,926 horses, 2,474 milch cows, 4,271 other cattle, 11,504 sheep, and 17,841 swine. Capital, Tusculumbia.

MILLER, Bénigne Emmanuel Clément, a French philologist, born in Paris in 1812. In 1834 he received an appointment in the manuscript department of the royal library, where he became thoroughly acquainted with Greek palæography. In 1835 and 1836 he was sent to the libraries of Italy and Spain to collect the scholia of Aristophanes. Among the results of his explorations were a *Supplément aux dernières éditions des petits géographes grecs* (8vo, 1839), *Catalogue des manuscrits grecs de la bibliothèque de l'Escurial* (4to, 1848), and *Poésies grecques inédites de Manuel Phile*. In 1851 he published at Oxford, under the title of *Philosophumena, sive omnium Hæresium Refutatio*, the text of a manuscript procured from Mt. Athos by Mynas, which he believed to be an original treatise of Origen, but which is now generally attributed to Hippolytus. In 1840-46 he published *Revue de bibliographie analytique* (6 vols.), which met with moderate success; and he has edited several minor Greek authors. He was also one of the principal editors of the *Recueil d'itinéraires anciens* (4to, with atlas, 1844). In 1849 he became librarian of the national assembly, and in 1860 was elected to the academy of inscriptions and belles-lettres. One of his latest works is *Mélanges de littérature grecque* (8vo, 1868).

MILLER, Edward, an American physician, born in Dover, Del., May 9, 1760, died in New York, March 17, 1812. He attended medical lectures in the university of Pennsylvania, spent about a year in the military hospital at Basingridge, N. J., and in 1782 went to France as the surgeon of an armed ship. In 1783 he entered on the practice of medicine in Maryland, and in 1788 graduated as M. D. in the university of Pennsylvania. In 1796 he removed to New York, and with Dr. Mitchell and Dr. Smith commenced the publication of the "Medical Repository," the first American medical journal. In 1803 he was appointed resident physician for the city of New York. He was a member of the American philosophical society, professor of the theory and practice of physic in the college of physicians and surgeons, and one of the physicians of the New York hospital. His "Report on the Yellow Fever of New York in 1805" is the source from which most later authors have drawn their arguments in support of the non-contagious nature of yellow fever. His writings, with a biographical sketch, were published by his brother, the Rev. Samuel Miller (8vo, 1814).

MILLER, Hugh, a British geologist, born at Cromarty, on the E. coast of Scotland, Oct. 10, 1802, died at Portobello, near Edinburgh, Dec. 26, 1856. He belonged to that half Scandinav-

vian population inhabiting the shores of the German ocean from Fife to Caithness. On his father's side he was fourth in descent in a line of sailors from John Feddes, one of the last of the buccancers on the Spanish main, who returned to Cromarty to enjoy his money, and built "the long, low house" in which his distinguished great-grandson passed his youth. On his mother's side he was of highland blood, and fifth in descent from Donald Roy of Rosshire, famed for his piety and his second sight. His father was drowned in a tempest (a fate which had befallen several of his ancestors) in 1807; and from that time, though still living with his mother, he was chiefly under the care of two maternal uncles, who had greater influence and authority over him until the age of manhood than any other persons. One was a harness maker and the other a cartwright, and he accounts them the most important of his schoolmasters. His uncle Alexander encouraged his early bent toward natural history, and taught him much about rocks, clouds, rains, tides, trees, ferns, shell fish, sea fowl, and insects. His uncle James interested him in human history, and gave him his liking for traditional lore, Scottish antiquities, social habits, and individual eccentricities. The tastes and predilections of both uncles were deeply impressed on him, and wherever he went in later life the geology and humanity of the district seemed equally to attract him. In his fifth year he was sent to a dame's school, where he learned to read. He was thence transferred to the grammar school of Cromarty, where he went through the ordinary course of rudimentary studies. He even began Latin with a view to college, but from distaste failed in it completely, being usually at the nether end of a very poor class, which position even he maintained only by displaying an unaccountable facility in translation. The master read aloud every morning in English the task assigned for the day, and Hugh was able to remember the whole rendering in its order, and to give it back in the evening word for word. Much of the leisure secured in this way was employed in reading translations from the classics by stealth. About his 15th year he attended for some time a subscription school set up as a rival to the grammar school. But from this whole amount of pedagogy he derived, according to his own estimate, only one advantage, namely, the faculty of reading books, with the correlative accomplishment of writing. He had acquired a reputation among his class fellows as a narrator of stories; and having exhausted the subjects of his reading and the various adventures that he had himself heard told, he was accustomed to extemporize with great success the wildest biographies. Meantime, other branches of his education had been going on outside of the school. He was the leader in excursions along the precipices and into the caves on the coast. He had learned to collect on the beach and to distinguish from each other the various rocks

of the locality, as porphyries, granites, gneisses, quartz, and mica schists, and had discovered for himself that Cromarty possessed among its minerals one precious stone, the garnet; and his observations in other departments had been encouraged and corrected by his uncle Sandy, who, as he always claimed, knew more of living nature than many professors of natural history. He had studied scenery, customs, and physiognomies in the highlands of Sutherlandshire, among his Gaelic cousins; had heard the story of Culloden from men who fought in the battle; had conversed with an old lady who witnessed the last witch-burning in the north of Scotland; and had acquired a habit, which marks his life and his writings, of studying historical monuments as well as geological formations, collecting local legends as well as fossils, delighting as much to discover a kelpie as a pterodactyl, and regarding types of character and phases of society in connection with the facts of science. The foremost youth in the district, his uncles wished him to prepare for Aberdeen college, and there to study for the church; but he demurred, declaring that he had no call to the sacred office, and they admitted that he had better be anything than an uncalled minister. A trade was therefore resolved upon, and he was apprenticed for three years to one of his relatives, who was a stone mason. From his 17th till his 34th year he led the life of an operative mason, journeying in summer to pursue his labors in different parts of Scotland, devoting all his leisure to earnest intellectual cultivation, reading all kinds of books on summer evenings and at home during the winter, and cherishing a belief from the beginning that literature and perhaps natural science would after all prove his proper vocation. During the first part of this period (1818-'25), as an apprentice and journeyman, he was subjected to all the coarse and rough experiences of his trade, working as one of a gang in quarries or in sheds, and passing his evenings in wretched highland bothies or in hovels in lowland villages. He afterward exchanged the life of a journeyman, working season after season for different masters, for that of a jobbing mason, undertaking private commissions in the way of his trade, such as the sculpturing and lettering of tombstones, stone dials, and the like; yet his habits of work continued in all respects to be those of a common mason, and his domestic accommodations those of any frugal Scotch mechanic. During this laborious period of his life he formed an intimate and extensive acquaintance with the best English and Scotch literature, embracing not only the departments of fiction, history, and poetry, but the philosophical works of Locke, Kames, Hume, Reid, Adam Smith, and Dugald Stewart. He seized upon every work of natural science that fell in his way, and moreover wrote a great variety of verses, rhapsodies, and reflections. His various scenes of labor made him familiar with the scenery, antiquities, and

social peculiarities of different parts of Scotland. But his greatest progress was in geology. Starting with hardly more than an empirical knowledge of the mineral characters of rocks, he soon detected the wonders of the fossil world in quarries remarkably rich in organisms. Wherever he went, from the shores of the Moray frith to those of the frith of Forth, the hammer was in his pocket, and his eye was searching for fossil specimens. Combining what he saw with what he read, he became, while yet hardly aware of it, not only a self-taught geologist, but a geologist capable of teaching others. To this period belong his discoveries in the old red sandstone, which only required to be known to insure him distinction in the scientific world. In 1825, work failing in the north, he sailed for the south of Scotland, and went from Leith to the capital. There he was occupied for two years, till his health began to fail, and he learned that few Edinburgh stonecutters pass their 40th year, and not one in 50 reaches his 45th. He therefore returned to Cromarty, accustomed to contemplate with rather pensive than sad feelings an early death, and soon after became seriously interested in the personal bearing of religious concerns. Until this time he describes himself as wavering between two extremes, now a believer and anon a skeptic, the belief being instinctive, the skepticism arising from some intellectual process. The result of his thoughts and conversations was that he found rest in the fundamental principles of Scottish evangelicism. His attainments soon made him a local celebrity; geologists in other towns corresponded with him; Cromarty ladies began to walk up to where he was at work to have the pleasure of conversing with him, one of whom was the young lady who afterward became his wife; and he was elected town councillor. He published a volume of "Poems written in the Leisure Hours of a Journeyman Mason" (1829); contributed a series of letters to the "Inverness Courier" on the herring fishery, which were collected in a volume; discovered deposits of ichthyic remains belonging to the second age of vertebrate existence, sufficient to prove not only the existence but the structure and varieties of fishes at that early period; and at length exchanged manual labor for the office of accountant in a branch bank opened at Cromarty. During the first two years of his accountantship his marriage took place, his "Scenes and Legends of the North of Scotland" was published, and he became a frequent contributor to periodicals. The non-intrusion controversy was then at its height in the Scottish church, and immediately after the adverse decision of the house of lords in the Auchterarder case he published his celebrated "Letter to Lord Brougham," which, as Mr. Gladstone affirmed, showed a mastery of pure, elegant, and masculine English that even an Oxford scholar might have envied. The leaders of the Free church were then look-

ing for a man to edit their contemplated organ, and at once selected Mr. Miller, who in 1840 removed to Edinburgh as editor of the "Witness." As a Scottish journalist he held a high and almost unique place. His leading articles were essays remarkable for their deliberate thought, elevated moral tone, strong Presbyterian feeling, and fine literary finish, and exerted a powerful influence on the formation of public opinion. His genius for description, literary culture, and relish for peculiar social characteristics appear also in his account of a vacation tour, entitled "First Impressions of England and its People." But his greatest eminence was achieved in the department of practical and speculative geology. He went to Edinburgh with the results of many years of scientific observation and reflection, with a collection of belemnites, fossil fishes, and other objects of natural history, and with a collection of thoughts and speculations about them, which in his own judgment formed his most valuable capital. During the first year of his editorship he published in the "Witness" a series of papers, afterward known collectively under the title of "The Old Red Sandstone, or New Walks in an Old Field," in which he detailed the story of his researches and revealed his discoveries of fossils in a formation which had till that time been deemed almost destitute of them. These were immediately recognized by savants as important additions to geological science. At the meeting of the British association in 1840 his labors were the principal theme; the fossils which he had picked up in boyhood in his native district were promoted to their due rank as *pterichthys Milleri*; and Murchison and Buckland spoke of his descriptive talent as casting plain geologists like themselves into the shade, and making them ashamed of their meagre style. His severe tasks endangered his health and compelled him to forego all literary labor during the greater part of 1845 and 1846; but he returned from his seclusion only to be more intimately associated with Dr. Chalmers in the counsels of the Free church. The appearance and popularity of the "Vestiges of the Natural History of Creation," embodying the development theory, and aiming to transfer the work of creation from the realm of miracle to that of natural law, caused him to prepare a reply, entitled "The Footprints of the Creator, or the Asterolepis of Stromness," an able and strongly fortified exposition of the opposite view, which had a very wide circulation in England and America. One of his most interesting works is "My Schools and Schoolmasters, or the Story of my Education," a full review of his life until the time of his settlement in Edinburgh. He published in 1848 the "Geology of the Bass Rock," lectured on geological subjects in Edinburgh and London, read papers before the British association, and had just completed at the time of his death his "Testimony of the Rocks," in which he dis-

cusses the Biblical bearings of geology. He toiled upon this task night and day, with little sleep or exercise, until, after a week or two of cerebral disorder, he himself became conscious that his mind was on the verge of ruin. He felt occasionally as if a very fine poignard had been suddenly passed through and through his brain, and in some of his paroxysms his face was a picture of horror before which even his wife shrank in dismay. He was found lifeless in his study, his chest pierced with the ball of a revolver which was found lying close by. In a pathetic note left for his wife he had written: "A fearful dream rises upon me. I cannot bear the horrible thought." His principal works have been republished in America.—See "The Life and Times of Hugh Miller," by Thomas N. Brown (republished, New York, 1860), and "Life and Letters of Hugh Miller," by Peter Bayne (2 vols., 1871).

MILLER, James, an American general, born in Peterborough, N. H., April 25, 1776, died in Temple, N. H., July 7, 1851. He was educated for the bar, but in 1808 entered the army as major. In May, 1813, he participated in the capture of Fort George. As colonel of the 21st infantry he fought with gallantry at Chippewa and Lundy's Lane. The success of the Americans in the latter conflict was mainly due to the capture of a British battery by his command. In reply to Gen. Scott's inquiry if he could take the battery, he said, "I'll try, sir." For these services he was brevetted brigadier general, and received from congress a gold medal. He was governor of Arkansas territory from 1819 to 1825, and collector of customs at Salem, Mass., from 1825 to 1849.

MILLER, James, a Scottish surgeon, born in 1812, died June 17, 1864. He was professor of surgery in the university of Edinburgh for more than 20 years, and at the time of his death of pictorial anatomy to the royal academy and consulting surgeon to the royal infirmary of Edinburgh and the royal hospital for sick children. He is especially noted for his systematic treatise on the "Principles and Practice of Surgery" (Edinburgh, 1844), which passed through four editions and is highly esteemed.

MILLER, Joaquin, an American poet, whose real name is Cincinnatus Hiner Miller, born in Indiana, Nov. 10, 1841. When he was about 11 years old his father emigrated to Lane county, Oregon, whence the boy went three years later to try his fortune in California. He wrote verses even then, although he knew nothing of the laws of versification nor of the rules of grammar. After a wandering life of several years, he returned home in 1860, and entered a lawyer's office in Eugene, Oregon. The next year he was an express messenger in the gold-mining districts of Idaho, which he left to take charge of the "Democratic Register," a weekly newspaper in Eugene. This was suppressed for its political sentiments during the war, and in 1863 he opened a law

office in Cañon City, Oregon. From 1866 to 1870 he served as county judge of Grant county, and during this time began to write his poems. He published first a collection in paper covers called "Specimens," and next a volume with the title "*Joaquin et al.*," from which he derived his pseudonyme. In 1870 his wife, whom he had married in 1863, obtained a divorce, and he went to London, where he published in the following year his "Songs of the Sierras." In 1872 appeared "Songs of the Sun Lands," and in 1873 a prose volume entitled "Life among the Modocs: Unwritten History."—His wife, MINNIE THERESA (DYER) MILLER, has also published verses, under the pseudonyme of "Minnie Myrtle."

MILLER, Joseph, an English actor, born probably in London in 1684, died there in 1738. He was popular on the stage, and performed with repute in several of Congreve's best comedies, particularly in "Love for Love" and "The Old Bachelor," to the success of which he is said to have materially contributed. In 1739 a book of jests passing under his name, and supposed to be the compilation of John Mottley, author of a life of Peter the Great, was published in London, and has gained a celebrity which preserves the name of its assumed author.

MILLER, Samuel, an American clergyman, born near Dover, Del., Oct. 31, 1769, died in Princeton, N. J., Jan. 7, 1850. He graduated at the university of Pennsylvania in 1789 (from which he received the degree of D. D. in 1804), studied theology, was licensed to preach in 1791, and in June, 1793, was installed as colleague pastor with Drs. Rodgers and McKnight of the first Presbyterian church in New York city. In 1813 he became professor of ecclesiastical history and church government in the theological seminary at Princeton, and discharged the duties of this office till May, 1849, when he resigned. Dr. Miller was a devoted friend of the Presbyterian church, and enlisted vigorously in the controversy which resulted in its division. He was the author of "A Brief Retrospect of the Eighteenth Century" (2 vols., New York, 1803; 3 vols., London, 1805); "Letters on the Constitution and Order of the Christian Ministry" (1807), with a "Continuation" (1809); "Memoirs of the Rev. John Rodgers, D. D." (1813); "Letters on Unitarianism" (Trenton, 1821); "Letters on Clerical Manners and Habits" (Philadelphia, 1827); "An Essay on the Office of Ruling Elder" (New York, 1831); "Letters to Presbyterians" (1833); "Discourses on Infant Baptism" (1834); "Presbyterianism the truly Primitive and Apostolical Constitution of the Church of Christ" (Philadelphia, 1835); "The Primitive and Apostolic Order of Christ vindicated" (1840); "Letters from a Father to his Sons in College" (1843); "A Sermon on the Ruling Eldership, with an Appendix" (1843); and "Thoughts on Public Prayer" (1849). He also wrote the "Life of Jonathan

Edwards" in Sparks's "American Biography," and published numerous pamphlets.

MILLER, Thomas, an English author, born in Gainsborough, Lincolnshire, Aug. 31, 1807, died in London, Oct. 25, 1874. He was at first a farmer's boy, devoted his leisure hours to study, and while following the trade of a basket maker began to attract attention by his verses and occasional pieces in prose, chiefly describing rural life and scenery. He came under the notice of Moore, Campbell, and Rogers, and the last named enabled him to set up as a bookseller, and thenceforth he became an industrious writer. Among his numerous novels are "Royston Gower" (1838), "Fair Rosamond" (1839), "Lady Jane Grey" (1840), "Gideon Giles the Roper" (1841), and "Godfrey Malvern" (1842). The most popular of his writings are his country books, including "A Day in the Woods," "Beauties of the Country," "Rural Sketches," "Pictures of Country Life," "Country Scenes," &c. He also wrote a "History of the Anglo-Saxons," and lives of Turner, Beattie, and Collins. His poetical works are: "Common Wayside Flowers" (1841); "Poetical Language of Flowers" (1847); "Original Poems for my Children" (1850); and "Songs for British Riflemen" (1860).

MILLER, William, an American religionist, born in Pittsfield, Mass., in 1781, died in Low Hampton, Washington co., N. Y., Dec. 20, 1849. In the war of 1812 he was captain of a company organized to protect the northern frontier. He was a farmer, whose early facilities for education were slight, and he seems never to have been master of what are usually deemed the requisite resources for Biblical criticism; but in 1833 he began to lecture on the speedy second coming of Christ, announcing, in accordance with his interpretation of the prophecies, that the earth was to be destroyed in 1843. Even the day was specified, if not by himself, by some of his principal followers. His earnest and confident manner attracted attention, his Scriptural and historical arguments seemed to many erudite and cogent, and after a few years of constant travel and preaching his disciples were reckoned at from 30,000 to 50,000. (See SECOND ADVENTISTS.)

MILLER, William Allen, an English chemist, born in Ipswich, Dec. 17, 1817, died in Liverpool, Sept. 30, 1870. At 15 years of age he was apprenticed to his uncle, who was surgeon to the general hospital in Birmingham. At the expiration of five years he entered the medical department of King's college, London, where he studied chemistry under Dr. Daniell, whom he assisted in his laboratory. In 1840 he passed some time in the laboratory of Liebig in Giessen, became demonstrator of chemistry in King's college, and in 1845 professor of chemistry. With Dr. Daniell he had investigated the electrolysis of salts, conducting all the experiments. In 1851 he was appointed a commissioner on the water supply of London, and

an assayer of the mint. He was the author of an important treatise entitled "Elements of Chemistry, Theoretical and Practical" (London, 1869), and of numerous scientific papers.

MILLET, a name given to grasses of several distinct species and genera; it is from the Italian *miglio*, diminutive of *miglio*, from the Latin *millium*, which in turn is supposed to be from *mille*, a thousand, in reference to its fertility. The present botanical genus *millet* does not include either of the plants known to agriculture as millet, but is a small genus in the tribe of *panicæ*, the principal species in which, *M. effusum*, is very widely diffused; this, which is known as millet grass and spreading millet, grows all over Europe and northern Asia, extending from the Mediterranean to the Arctic circle, and in this country from New England to Illinois and northward; it is generally found in cool and damp woods. It is a slender grass, sometimes 4 or 6 ft. high, with broad, flat, thin leaves and a spreading panicle; the spikelets, by the suppression of one of the glumes, appear as if one-flowered. This grass is not regarded as of any agricultural value, but in England its growth is encouraged in woods on account of the great fondness of pheasants for its abundant seeds.

—What is known as the double-seeded or double-bearing millet grass was formerly placed in this genus, but is now called *amphicarpum*, a name given upon the supposition that it was doubly fruit-bearing; it has panicles like other grasses, but the spikelets (or flowers), though perfect, drop without maturing seeds; at the base of the plant another set of flowers is produced; these are solitary at the end of slender runner-like stalks, and are fertilized and perfect their fruit wholly underground. This plant is found abundantly in New Jersey, and since the cranberry has been so largely cultivated in that state it has attracted much attention, and was at one time regarded as a dangerous enemy to the culture; after the bogs have been prepared and planted with cranberries, this double-seeded millet grass makes its appearance in the greatest profusion, and apparently threatens destruction to the plants; but it is found that it does no great injury, and that the cranberry plants soon take possession of the soil to the exclusion of the grass. This species is *A. Purshii*, and extends southward to Georgia. Another and much more rigid species is *A. Floridanum*, very local in Florida.—The true millet of an-



Millet (*Panicum miliaceum*).

cient and modern agriculture is *panicum miliaceum*. The genus *panicum* (the ancient name for a grass which is now placed in another genus) is a very extensive one, about 850 species being enumerated; yet but few of them are ranked among the useful grasses, and millet is one of the few that furnish food; this has been so long in cultivation that the history of its origin is very obscure. It has a strong stem, 2 to 4 ft. high, with a profusion of foliage; its abundant flowers are in large, open, nodding panicles, and the plant has much the appearance of a miniature broom corn; the seeds afford a very nutritious flour. The plant requires a dry rich soil, and when now cultivated it is usually for forage, to be cut and cured like grass before the seeds are ripe enough to drop. The ease with which our farmers can raise crops of fodder corn (maize) precludes the growing of this and other forage crops which are valued in Europe.—Hungarian, German, and Italian millets are varieties of *setaria Italica*. The genus *setaria* is regarded by some botanists as a section of *panicum*, the only difference between them being that in *setaria* the short pedicels of the flowers are prolonged beyond them into bristles, which in the millet species are in clusters of two or three and longer or shorter than the flowers. In this as in most other setarias the spikelets or flowers are collected in a very dense spike-like panicle, which in some forms is a foot or



Hungarian Millet (*Setaria Germanica*).

more long, and usually interrupted at the base. None of these millets are cultivated in this country for their seeds, unless occasionally for feeding poultry, but they have obtained in some localities a place as forage plants. The most useful is the Hungarian millet, more generally called Hungarian grass (*S. Italica*, var. *Germanica*), which is excellent to supplement a short hay crop; it is an annual, of very rapid growth, and on rich soils gives a very large amount of green fodder, or it may be made into hay. If to be cured, it should be cut as soon as it blooms, and before the numerous small bristles of the flowers become firm, as these when ripe and rigid may prove injurious to horses. This *setaria* is a most variable species, and every few years a new form of it is introduced with a new name, which does not prove essentially different from the old. Other species of *setaria* are known as fox-tail and bottle grasses; they are com-

mon in cultivated grounds as weeds. Long before *sorghum* was cultivated in this country as a sugar plant, a variety of it was grown as Indian millet. (See *Sorghum*.)

MILLET, Aimé, a French sculptor, born in Paris about 1816. He studied under David d'Angers, and became famous in 1857 by his "Ariadne," which was purchased by the government. The most celebrated of his recent works are a statue on the tomb of Henri Murger, "Apollo" in the grand opera house, the monument of Baudin in Père Lachaise, and a statue of a *garde mobile* for Léon Dupré's monument to the guards of the department of Eure who fell in the war of 1870-71.

MILLET, Jean François, a French painter, born about 1815, died Jan. 18, 1875. He studied under Delaroche, and was distinguished for his genre pictures and landscapes, which represent rural life according to the realistic school with remarkable fidelity. Among his finest works are "A Girl shearing Sheep" (1861), which was again exhibited with other works in 1867; "Teaching Tricot" (1869); "November," and "A Woman making Butter" (1870).

MILLET, Pierre, a French missionary, born in 1631, died in Quebec, March 22, 1708. He came to America in 1666, and was soon after sent to Onondaga, laboring there and at Oneida till 1684, and making a few converts. He returned to Oneida in 1688, but because of the English influence could not restore his mission. While acting as chaplain at Fort Frontenac in 1690, he was lured out by the Indians and taken prisoner. The Christian Oneidas in the large Iroquois force claimed him, and he was sent to their canton, and finally adopted into the tribe. The New York authorities who had been hostile to him now endeavored to induce the Oneidas to give him up; but they refused, and he remained there till October, 1694, to the great annoyance of New York, the governors of that colony endeavoring to effect his release, and the governors of Canada to prevent it. His own account of his captivity was published at New York in 1865.

MILLIN, Aubin Louis, a French archaeologist, born in Paris, July 19, 1759, died Aug. 14, 1818. He was keeper of the museum of antiquities in the national library. His principal works are: *Peintures des vases antiques*; *Monuments antiques inédits*; *Galerie mythologique*; *Voyage dans les départements du midi de la France*; and *Histoire métallique de la révolution française*. His "Medallie History of Napoleon," left incomplete, was published in English by J. Millingen (London, 1819). He was the founder of the *Magasin encyclopédique* and *Annales encyclopédiques*.

MILLOT, Claude François Xavier, a French ecclesiastic, born at Ornans, Franche-Comté, March 5, 1726, died in Paris, March 21, 1785. He entered the society of Jesus, and became professor of rhetoric at their college in Lyons; but his relation with them was brought to a close by their objections against his eulogy of

Montesquieu. He then devoted himself to the preparation of historical works for schools, which obtained for him in 1768 the chair of history at the college of nobles in Parma. In 1777 he became a member of the French academy, and in 1778 preceptor of the duke d'Enghien. His works on French, English, and general history were united under the title of *Œuvres de l'abbé Millot* (15 vols., 1800; 2d ed., 12 vols. 8vo, 1819).

MILLS, I. A S. W. county of Iowa, bordering on Nebraska, from which it is separated by the Missouri river, and drained by the Nishnabotona river and branches; area, about 400 sq. m.; pop. in 1870, 8,718. It is intersected by the Burlington and Missouri River, and the Kansas City, St. Joseph, and Council Bluffs railroads. The chief productions in 1870 were 162,901 bushels of wheat, 1,380,055 of Indian corn, 191,569 of oats, 80,074 of potatoes, 11,652 lbs. of wool, 182,755 of butter, and 16,471 tons of hay. There were 4,122 horses, 3,638 milch cows, 6,816 other cattle, 3,354 sheep, and 13,985 swine; 3 manufacturing of brick, 2 of brick and stone, 4 saw mills, and 5 flour mills. Capital, Glenwood.

II. A S. E. central county of Dakota, recently formed, and not included in the census of 1870; area, about 1,000 sq. m. It is intersected by the Dakota river and several of its affluents. The surface is rolling, and consists mostly of prairies.

MILLS, Charles, an English historian, born at Greenwich, July 29, 1788, died in London, Oct. 19, 1825. He studied law, but abandoned it for literary pursuits. His principal works are: "History of Mohammedanism" (8vo, London, 1817); "History of the Crusades" (2 vols. 8vo, 1820); and "History of Chivalry" (2 vols. 8vo, 1825).

MILLS, Clark, an American sculptor, born in Onondaga co., N. Y., Dec. 1, 1815. He lost his parents in childhood, and learned the trade of a plasterer, which he followed in Charleston, S. C., for nine years. He early manifested a taste for sculpture, and in 1846 made a marble bust of John C. Calhoun, which was purchased for the city hall of Charleston. In 1848 he was invited to furnish a design for an equestrian statue of Jackson, for Lafayette square, Washington. His design was accepted, and he finished, after two years' labor, a full-sized model in plaster, which was so balanced that it rested on the horse's hind feet alone, without other support. Mills had now to build a foundry and to learn the practical business of casting, for there was no establishment large enough for the purpose, and no workman in the country capable of casting so large a mass. After numerous trials, interrupted by unforeseen accidents, he produced a perfect cast in October, 1852, and the statue was set up in 1853, on Jan. 8, the anniversary of the battle of New Orleans. It was completed at a loss to him of \$7,000, but congress made him an appropriation of \$20,000. At the same ses-

sion the sum of \$50,000 was appropriated for a colossal equestrian statue of Washington, which was inaugurated in Washington on Feb. 22, 1860. Mr. Mills's next employment was the casting of the colossal statue of Liberty, from a design by Crawford, which now crowns the dome of the capitol. It was finished in 1863.

MILLS, Samuel John, jr., an American clergyman, born in Torrington, Conn., April 21, 1783, died at sea in June, 1818. His father was a Congregational minister. He entered Williams college in 1806. In September, 1808, a society was formed in the college "to effect, in the persons of its members, a mission or missions to the heathen;" and the first name appended to its constitution was that of Mr. Mills. This was the first foreign missionary organization in America. He graduated in 1809, spent some months at Yale college, and in the spring of 1810 entered Andover theological seminary, where he found others interested in the subject; and on June 28, in connection with Messrs. Judson, Nott, and Newell, he presented a memorial to the general association of Massachusetts, stating their views and wishes, and asking advice. This led directly to the formation of the American board of commissioners for foreign missions. In 1812, soon after he was licensed, he went on a missionary tour to the southwestern states, under the combined patronage of the Connecticut and Massachusetts missionary societies. On this tour he preached and organized Bible and other religious benevolent societies. In July, 1814, he made a second tour to the same region, accompanied by the Rev. Daniel Smith. He published an account of these two trips on his return (Andover, 1815). He was ordained June 21, 1815, and passed most of the next two years in Albany, New York, Philadelphia, and Washington. Among the fruits of these two years' labor may be named the establishment of the foreign mission school at Cornwall, Conn., the organization of the American Bible society and of the united foreign missionary society, afterward merged in the American board, the first movement for city missions in New York, the establishment of a school for the education of colored preachers and teachers at Parsippany, N. J., by the synod of New York and New Jersey, and the organization of the American colonization society. Almost immediately after its organization, the colonization society sent Mr. Mills and the Rev. Ebenezer Burgess to Africa, to select a site for a colony. In February, 1818, they embarked at London for the African coast, where they spent two months. Having fulfilled the object of their mission, they sailed on their return, May 22, 1818, and Mr. Mills died before reaching home.—See "Memoirs of Samuel J. Mills," by the Rev. Gardiner Spring (8vo, New York, 1820).

MILLSTONE, a hard and rough stone in one or many pieces, formed into cylindrical shape, from 3 to 7 ft. in diameter, and 8 to 18 in. thick, used together with another of the same

size and shape for grinding grain, &c. The lower stone is firmly fixed in its bed, and is known as the "bedder." The upper one, called the "runner," is suspended over this so as to revolve with its lower face exactly parallel to the upper face of the lower stone, and more or less close to it according to the required fineness of the flour. The grain is admitted through a hole in the centre of the upper stone from the hopper above; and as it is ground the flour escapes round the outer edges. Grooves are cut on the face of each stone, radiating from near the centre to the periphery, and one edge of these grooves is sharp and perpendicular to the face. The two stones being cut alike, when they are turned face to face these edges work against each other and crush the grain between them. The flat portions each side of the grooves are called "lands." The best millstones are made of buhrstone. (See *Buhrstone*.) They continue in use sometimes as long as 20 years, the edges being occasionally recut. Very hard granite is also used for millstones, and the Shawangunk sandstone has long been quarried at Esopus, N. Y., for the same purpose.

MILLSTONE GRIT, a geological formation, principally a conglomerate, composed of silicious sand and small pebbles; it is also called grit rock and grindstone grit. It is named from the frequent use to which it is put, particularly in England. The formation lies at the commencement of the coal period, being located between the subcarboniferous period and the lower coal measures, and marks the transition from the marine to the terrestrial period. The area that had been covered with fields of crinoids was swept during the millstone grit epoch by currents and waves which left the surface under a great depth of pebbles and sand. The coarseness of the beds along the Appalachian region in Pennsylvania indicates that this was the border reef of the continent, and its great thickness, exceeding 1,200 ft., shows that it was also a region of great subsidence. The formation here is mostly a whitish silicious conglomerate, with some sandstone layers and a few thin beds of carbonaceous shales. At Tamaqua the thickness is 1,400 ft.; at Pottsville, 1,000 ft.; in the Wilkesbarre region, from 200 to 300 ft.; and where it caps the mountain at Blossburg it is from 50 to 100 ft. In Virginia the thickness sometimes reaches 1,000 ft., and the rock is mainly a sandstone, but contains heavy beds of conglomerate. It may be remarked that the conglomerate of the subcarboniferous period becomes also in Virginia a sand rock. In Alabama it is a quartzose grit of great thickness, and is used for millstones. In Tennessee there are two heavy beds of conglomerate, with several thick coal beds between them, and also below both, which are generally referred to the false coal measures of the millstone grit epoch. The millstone grit formation extends over parts of some of the southern counties of New York,

having a thickness of from 20 to 60 ft. In Cattaraugus and Alleghany counties, on account of the regularity of the joints, it stands out in huge blocks, forming walls and square structures which have received the names of "Rock City" and "Ruined City." Among the plants of this formation, according to Lesquereux, are lepidodendrons, sigillaria, and calamites, with several species of ferns.

MILLVILLE, a city of Cumberland co., New Jersey, on Maurice river, at the head of navigation, and on the West Jersey railroad, 40 m. S. of Philadelphia; pop. in 1870, 6,101. It contains a large cotton factory, and three iron foundries for the manufacture of water and gas pipes and turbine water wheels. The immense wheels for the Fairmount water works, Philadelphia, were cast here. It has also several manufactories of hollow glassware and window glass, three large lumber mills, a national bank, 11 public schools, including a high school, two weekly newspapers, and nine churches.

MILMAN, Henry Hart, an English author, born in London, Feb. 10, 1791, died there, Sept. 24, 1868. He was the youngest son of Sir Francis Milman, physician to George III., and was educated at Eton and at Brasenose college, Oxford, where he obtained a fellowship. His literary career commenced in 1815, with the publication of "Fazio," a tragedy performed successfully at Covent Garden; and in 1817 he took orders and was presented to the vicarage of St. Mary's, Reading. In 1818 he published "Samor, Lord of the Bright City, an Heroic Poem," founded on passages in the legendary history of Britain, and in 1820 his most successful production in verse, "The Fall of Jerusalem," a dramatic poem. In the succeeding year he was appointed professor of poetry in the university of Oxford, and published three other dramatic poems, "The Martyr of Antioch," "Belshazzar," and "Anne Boleyn." In 1826 he was appointed Bampton lecturer, and in the following year appeared his "Sermons at the Bampton Lecture," in 1829 his "History of the Jews" (3 vols. 18mo), published anonymously, and in 1840 a collected edition of his poetical works. In the same year he produced one of his most elaborate works, a "History of Christianity from the Birth of Christ to the Abolition of Paganism in the Roman Empire" (3 vols. 8vo), and in 1854-5 a "History of Latin Christianity, including that of the Popes, to the Pontificate of Nicholas V." (6 vols. 8vo), designed as a continuation of the former, although it is a complete work. He prepared a sumptuously printed and illustrated edition of Horace (8vo, 1849), with a life of the poet and criticisms on his writings, an annotated edition of Gibbon's "Decline and Fall of the Roman Empire," preceded by a life of the historian, a "Memoir of Lord Macaulay," a "Life of John Keats," and translations of the "Agamemnon" of Æschylus, the "Bacchæ" of Euripides, and some of the minor Greek poets. In 1862 he revised

and almost completely rewrote his "History of the Jews" (3 vols. 8vo). His later works are: "Hebrew Prophecy, a Sermon" (1865); "Annals of St. Paul's Cathedral" (1868); and "Savonarola, Erasmus, and other Essays" (1870). In 1866-'7 a complete edition of his "Historical Works" was published (15 vols. post 8vo). In 1849 Milman was made dean of St. Paul's.

MILNE, William, an English missionary, born in the latter part of the last century, died in China in 1822. In 1813 he visited China under the auspices of the London missionary society, and during the next two years travelled extensively through that country, Malacca, and the chief islands of the Indian archipelago, distributing many thousand tracts and Testaments among the natives. He subsequently established himself in Malacca, and founded a missionary station, which became one of the most important in eastern Asia. He continued to circulate the Scriptures, and also superintended the publication of religious works and of a monthly magazine. In 1817 he was again in China, where he projected the plan of an Anglo-Chinese college, aided in translating the Old Testament into Chinese, and originated the "Indo-Chinese Gleaner," a quarterly publication. He died in the midst of his labors. He is the author of a "Retrospect of the Protestant Mission to China."

MILNE-EDWARDS, Henri, a French naturalist, born in Bruges, Belgium, Oct. 23, 1800. His father was an Englishman. He studied medicine in Paris and took his degree there in 1823, but abandoned practice for physiological pursuits. He occupied for a time the chair of natural history in the lyceum of Henry IV., and in 1841 accepted a similar post in the museum and the faculty of sciences, of which he became president. In 1838 he succeeded F. Cuvier in the academy of sciences, and in 1854 he was elected a member of the academy of medicine. In 1856 he received the Copley medal of the royal society of London. He was chosen in 1862 professor of zoology in the museum and faculty of sciences, and in 1864 assistant director in the same institution. His publications comprise *Recherches anatomiques sur les crustacés* (1828); *Manuel de matière médicale* (1832); *Nouveau formulaire pratique des hôpitaux* (4th ed., 1840); *Cahiers d'histoire naturelle* (1834); *Éléments de zoologie* (1834-'5); *Histoire naturelle des crustacés* (3 vols., 1837-41); *Histoire naturelle des coralliaires, ou polypes proprement dits* (3 vols., 1858-'60); *Leçons sur la physiologie et l'anatomie comparée de l'homme et des animaux* (1855-'65); *Histoire des mammifères* (1872 et seq.), &c. He also superintended the publication of a new edition of Lamarck's *Histoire naturelle des animaux sans vertèbres* (11 vols. 8vo, 1834-'45).—His son **ALPHONSE**, born in Paris in 1835, is a professor in the school of pharmacy, and the author of several works on natural history.

MILNER, John, an English Roman Catholic author, born in London in October, 1752, died in Wolverhampton, April 9, 1826. He was educated at Edgbaston and Douai, and in 1779 was stationed at Winchester. His "History, Civil and Ecclesiastical, and Survey of the Antiquities of Winchester" (2 vols. 4to, 1798-'9), led to religious controversy, and he issued "Letters to a Prebendary," Dr. Sturges (1800), and "End of Religious Controversy" (1818), which are regarded by Catholics as among their ablest books. Several answers to the "End of Controversy" have appeared. In 1803 he was made bishop of Oastabala and vicar apostolic of the Midland district, and he took an active part in opposing the proposed granting of a veto to the English government on the appointment of Catholic bishops. His other works, chiefly occasional, are numerous, and include "Notes on Ireland," a life of Bishop Challoner, a supplement to Butler's "Memoirs of the Irish Catholics," and an investigation into the life of St. George.

MILNER. I. Joseph, an English historian, born near Leeds, Jan. 2, 1744, died in Hull, Nov. 15, 1797. He graduated at Cambridge in 1766, and after taking orders became head master of the grammar school and lecturer of the principal church of Hull. His most important work is a "History of the Church of Christ from its Foundation to the 13th Century" (3 vols. 8vo, London, 1794). It was continued by his brother to the reformation. A complete edition of his works, with an account of his life, was published by his brother in 1810, in 8 vols. 8vo. **II. Isaac**, brother of the preceding, born near Leeds, Jan. 1, 1751, died in London, April 1, 1820. On the death of his father he left school, and worked for a time in a factory; but his brother employed him as an assistant in the grammar school at Hull. In 1770 he entered Queen's college, Cambridge, where in 1774 he became senior wrangler, and in 1775 was elected a fellow. In 1783 he became professor of experimental philosophy, in 1788 master of Queen's college, and in 1791 dean of Carlisle. At Cambridge he formed an intimacy with William Wilberforce which endured through life, and he died in his house. His principal works are: a continuation of his brother's "History of the Church of Christ," "Animadversions on Dr. Haweis's Church History" (8vo, 1800), "Essay on Human Liberty," and two volumes of "Sermons."

MILNES, Richard Monckton. See Houghton, Lord.

MILNOR, James, an American clergyman, born in Philadelphia, June 20, 1773, died in New York, April 8, 1844. After spending a brief period at the university of Pennsylvania, he began the study of law in his native city in 1789, was admitted to the bar in 1794, and practised his profession at Norristown till 1797, when he removed to Philadelphia, where he served in several public stations. In 1810 he became a representative in congress, where he

opposed the war of 1812. He entered the ministry of the Protestant Episcopal church in 1814, and in 1816 was called to St. George's church, New York, where he remained till his death. Dr. Milnor's labors were abundant, not only in the discharge of his parish duties, but also in connection with the Bible and tract societies, and other philanthropic and charitable institutions. He published a few occasional sermons and addresses.—See "Memoirs of the Life of James Milnor," by the Rev. J. S. Stone, D. D. (8vo, New York, 1848).

MILO. See MELOS.

MILO, or **Milon**, a Greek athlete of the latter part of the 6th century B. C., born in Crotona, Magna Græcia. His extraordinary physical strength gave him the victory in wrestling six times at Olympia, and as often in the Pythian games. He is said to have carried a four-year-old heifer on his shoulders four times around the Olympic race course, and then to have eaten the whole of it in one day. In 511 he was appointed to command an army against the Sybarites, and bore an important part in the battle of the Crathis. He was worsted by the agility of his adversary in his seventh Olympic struggle. When enfeebled by age, it is said, he attempted to tear asunder with his hands a forest tree partially split by woodcutters; he was caught and held fast by the closing of the fissure, and was devoured by wolves.

MILO, **Titus Annius Papinianus**, a Roman tribune and demagogue, born at Lanuvium in the early part of the 1st century B. C. In 57 he filled the office of plebeian tribune. At that period Clodius, at the head of a band of desperadoes, controlled the destinies of Rome, burning temples, attacking the houses of private citizens, shedding the blood of freemen in the streets, dispersing the comitia by violence, and trampling under foot all laws. Milo, who was little better than Clodius, but desirous of retrieving his ruined fortunes by an alliance with the aristocrats, temporarily restored order, after which Cicero was recalled from exile. Clodius, who had been the author of Cicero's banishment, assailed his person and property, and would have sacrificed him had not Milo come to his aid. The followers of Milo and Clodius fought daily in the streets. The rival chiefs and their retainers met at Bovillæ, on the Appian way, in January, 52, and in the fray Clodius was slain. Milo was brought to trial, and Cicero, his advocate, was so intimidated that he did not venture to deliver the oration he had prepared; his client was convicted and went into exile to Massilia, where he remained till 48, when he returned to aid Marcus Cælius in resuscitating the republican party, but was defeated and slain in Lucania.

MILTIADES, an Athenian statesman, who flourished at the beginning of the 5th century B. C. He was of a noble family, son of Cimon, and nephew of the elder Miltiades, who was prominent in Athens in the time of Pisistratus, and was also the founder of a despotism

in the Thracian Chersonese. He was sent out about 516 to take possession of his uncle's inheritance. To secure his position, he imprisoned the chief men by stratagem, employed a force of mercenaries, and married the daughter of a Thracian prince. He joined Darius Hystaspis on his expedition against the Scythians, and remained with the Ionians to guard the bridge over the Danube while the Persian army advanced northward. When the appointed time had passed, and nothing had been heard from Darius, he is said to have urged the destruction of the bridge and the abandonment of the Persians, but to have been overruled by the Ionian leaders, who maintained their own ascendancy by Persian support alone, the feeling of the population being everywhere against them. Had his opinion prevailed, says Grote, he would have inflicted on Persia a more vital blow than the victory of Marathon. He remained in the Chersonese till about 493, with the exception of a brief interval. His only achievement during this period was the conquest of Lemnos and Imbros, which probably took place while the Persians were occupied with the Ionic revolt (between 501 and 494). He thus drew upon himself the hostility of Darius, was driven from the Chersonese at the close of the Ionic war, and on his flight to Athens narrowly escaped capture by the Phœnician fleet. He was brought to trial by the Athenians for alleged despotism in his administration of the Chersonese, but was honorably acquitted, and his fame as the conqueror of Lemnos secured his election as one of the ten generals at a time when the Persian armament under Datis and Artaphernes was approaching Greece. While the generals were equally divided whether to meet the enemy in the field or to defend the city behind its walls, Miltiades persuaded the polemarch Callimachus to give his casting vote in favor of immediate attack, and thus brought on the battle of Marathon. Though the other generals surrendered to him their days of command, it is said that he waited till his own day before he engaged the enemy, and achieved the most memorable victory in the history of Greece. (See MARATHON.) The admiration of him by his countrymen was now unbounded. At his request, he was intrusted with an armament of 70 ships, no other man knowing its destination. He sailed against the island of Paros to gratify a private animosity, and ravaged the island, but failed to capture the town. Being seized with a panic while visiting a priestess on a superstitious errand, he strained or bruised his thigh by falling and raised the siege. On his return to Athens he was impeached and condemned to pay a penalty of 50 talents, and soon after died of his wound. According to Cornelius Nepos and Plutarch, he was imprisoned after being fined, but this is not stated by Herodotus. The fine was afterward paid by his son Cimon.

MILTON, a N. county of Georgia, bounded S. E. by the Chattahoochee river, and watered by

several streams; area, about 150 sq. m.; pop. in 1870, 4,284, of whom 466 were colored. The surface is broken and the soil generally fertile. The chief productions in 1870 were 24,896 bushels of wheat, 93,095 of Indian corn, 15,331 of oats, 9,015 of sweet potatoes, 3,048 lbs. of wool, 24,026 of butter, and 9,759 gallons of sorghum molasses. There were 457 horses, 2,191 cattle, 1,921 sheep, and 4,398 swine. Capital, Alpharetta.

MILTON, a township and post village of Rock co., Wisconsin, on the Chicago, Milwaukee, and St. Paul, and the Chicago and Northwestern railroads, 30 m. S. E. of Madison, and 62 m. by rail S. W. of Milwaukee; pop. in 1870, 2,010. It is the seat of Milton college, established in 1867 by the Seventh-day Baptists. This institution has normal, scientific, and classical (embracing preparatory and collegiate) courses. In 1873-'4 it had 8 instructors, 203 students (78 of collegiate grade), and a library of 1,800 volumes. It admits both sexes.

MILTON, John, an English poet, born in London, Dec. 9, 1608, died there, Nov. 8, 1674. His father had been disinherited at an early age for abandoning the Catholic faith, adopted the profession of scrivener or copying lawyer, and retired with an independence. Though inclined to Puritanic habits, he had cultivated literature in his leisure, and holds a respectable rank among the contemporary composers of madrigals, songs, and psalms. Milton thus received the training of a Puritan family, and was also taught the art and science of music, becoming an accomplished organist. In his writings, whenever he speaks of music, he is always technically and strictly correct. His father secured for him the best educational advantages, and both as a boy and a man Milton was severely and constantly studious. He was still under the care of a private tutor when, being scarcely 12 years old, he was sent to the school of St. Paul's. Even at that age he seldom retired to rest from his studies till after midnight. There began his memorable friendships with Diodati and Gill. He was able to compose Latin prose and verse with ease and elegance, was familiar with Greek and Hebrew, and had "no mean apprehension of the sweetness of philosophy," when he was entered, Feb. 12, 1625, as a pensioner at Christ's college, Cambridge. Though destined to the church, he resolved early in his university career upon a life of continued study, with no professional aim, but with a view to authorship. He led a life of singular intellectual independence, did not conceal his disinclination to the scholastic sciences, and for a time was at variance with the authorities and was rusticated. His personal beauty is uniformly mentioned by those who describe his youth as very remarkable. His light brown hair, parted in the middle, fell in curls upon his shoulders; the expression of his clear gray eyes was serene and thoughtful; and, though he excelled in manly exercises, his fair complexion, slight figure,

and innocent life caused him to be styled by his fellow collegians "the lady of Christ's." On quitting the university in 1632, he took up his abode in the village of Horton, Buckinghamshire, whither his father had retired from London. There he spent the next five years in "a ceaseless round of study and reading," devoting his time chiefly to the Greek and Latin poets. At this time he wrote the "Sonnet to the Nightingale," the companion pieces "L'Allegro" and "Il Penseroso," the masques of "Arcades" and "Comus," and the elegy of "Lycidas." None of his other compositions are so tranquil and happy in tone, or indicate so distinctly his love of the lighter graces of poetry. They are replete with rural imagery, delicate fancies, playful allusions, and sensuous descriptions, and the themes and the idyllic treatment strikingly contrast with the poems which he produced after 20 years of conflict in public life. On the death of his mother in 1637 he obtained his father's permission to travel on the continent, especially in Italy; and he set out in the following year, attended by a single servant. In Paris he was welcomed by the English ambassador and introduced to Grotius; in Florence, where he remained two months, he made the acquaintance of Galileo and was received into the literary academies, before which, according to custom, he gave evidence of his learning, and recited some of his Latin poems and three Italian sonnets, which won the encomiums of Italian wits and scholars; in Rome he made another stay of two months, protected by Lucas Holstein, the librarian of the Vatican, and by Cardinal Barberini. He abandoned his purpose of going to Sicily and Greece on receiving tidings of the impending rupture between the king and people in England, as he considered it dishonorable to be pursuing his own gratification abroad while his countrymen were contending for liberty. He returned to England by way of Rome, where he again remained two months, and, though warned of Jesuitical plots, openly "defended the reformed religion in the very metropolis of popery" without fear or molestation. He reached home in August, 1639, after an absence of 15 months. He had already determined to write a great poem, but his meditations were interrupted by the civil commotions, and by a period of 20 years during which the literature of England was almost exclusively polemical. He entered into the political disputes of the day, and during the whole splendid and vexed era of Puritan supremacy in England, with the exception of a few sonnets, he appears only as a polemical prose writer and champion of the revolution. During his absence his father had broken up his household at Horton. Milton therefore hired apartments and afterward a house in London, and received his two young nephews Edward and John Phillips, sons of his sister Anne, to board with him as pupils. A few more pupils, sons of intimate friends, were afterward admitted;

and while pursuing his private studies he devoted a part of his time to their education after a peculiar system of his own. He was thus occupied with studying and teaching when he published his first pamphlet. The long parliament met in 1640; Laud and Strafford were overthrown; the danger from free speech was removed; and the circumstances of the time offered an invitation to thinkers. Prominent among topics of public interest was that of church reform, and Milton published a vehement attack on the episcopal form of government entitled "Of Reformation, touching Church Discipline in England, and the Causes that hitherto have hindered it" (1641). In the same year Bishop Hall of Norwich, at the request of Laud, undertook a defence of episcopacy, and was answered by a combination of five Puritan ministers under the title of Smectymnus, a word composed of the initials of their names. Archbishop Usher replied to the Smectymnans, and Bishop Hall published a defence of himself. Milton published two pamphlets in answer to the former, entitled "Of Prelatical Episcopacy" and "The Reason of Church Government urged against Prelaty," and a tract in the form of a dialogue entitled "Animadversions" upon Bishop Hall's defence. The last drew forth an anonymous and slanderous response, attributed to a son of the bishop; and the controversy was concluded by Milton's "Apology for Smectymnus" (1642), in which in an eloquent self vindication he gives an interesting account of his education, studies, and pursuits, and a eulogy of the long parliament. In 1643 he was resting from controversy, occupied with his pupils, and meditating the great poetic work to which he wished to transfer all his mental power and industry. But in the midst of civil war and of epical contemplations he contracted a singular marriage. "About Whitsuntide," says Phillips, "he took a journey into the country, nobody about him certainly knowing the reason, or that it was more than a journey of recreation. After a month's stay, home he returns a married man, who set out a bachelor; his wife being Mary, the eldest daughter of Mr. Richard Powell, then a justice of the peace at Forest Hill, near Shotover, in Oxfordshire." It appears that his father had made a memorandum to him of a debt due from Powell, the larger part of which was never paid; that his numerous rides to Forest Hill in quest of money resulted only in a matrimonial engagement; that he never received a shilling of the £1,000 promised with his wife; and that he encountered "a mute and spiritless mate" where he had expected "an intimate and speaking help." Moreover, it was a marriage amid civil conflict between a renowned parliamentarian and a lady of a royalist family. She remained only one month with her husband, and then accepted an invitation from her family, probably suggested by herself, to go back and spend some time in the country; and at a secure distance she

treated both the letters and messengers of the poet with contempt, and refused to return. The pleas suggested on her side are that she was used to company and merriment, and disliked Milton's "sparse diet and hard study;" the poet's chief and singular ground of complaint was that his wife would not talk; it is probable that they simply disliked each other, and that nothing but an imprudent marriage suggested to him "the pious necessity of divorcing," even in cases that depend upon "utterless facts." Milton came to the conclusion that other reasons, besides those legally admitted, might be sufficient for the dissolution of the nuptial tie, and determined publicly to argue his case. With the intellectual clearness and boldness which are his special characteristics, he pushed his ideas of civil and ecclesiastical liberty into the realm of the domestic circle; and he resolutely advanced the doctrine that moral incompatibility as well as conjugal infidelity justifies divorce. It should be noticed that he does not disguise his opinion of the natural inferiority of woman. His publications on this subject are: "The Doctrine and Discipline of Divorce restored to the Good of Both Sexes from the Bondage of Common Law" (two editions in 1644); "The Judgment of Martin Bucer touching Divorce" (1644), in which he shows that a celebrated contemporary of King Edward VI. had been of the same opinion as himself; "Tetrachordon, or Expositions upon the four chief Places in Scripture which treat of Marriage or Nullities in Marriage" (1645); and "Colasterion: a Reply to a Nameless Answer against the Doctrine and Discipline of Divorce" (1645). His efforts for a change of law were a failure, but he retained his opinions till the close of his life. The discussion of the subject which he raised was no less intolerant and impatient than that on episcopacy had been, and during its progress he was summoned to the bar of the house of lords, but was honorably dismissed. Meantime he had published his tractate "On Education" (1644), only the theoretical views of which are important, and had addressed to the parliament the noblest and most useful of his compositions in prose, the "Areopagitica, a Speech for the Liberty of Unlicensed Printing" (1644). It is a plea for freedom in literature; but though it contains some of his finest passages of prose eloquence, it was not successful in its aim of abolishing the newly established censorship. In 1645 appeared in a small volume the first edition of his poems. In the same year a reconciliation was effected between him and his wife. She returned to his house, and her whole family were generously entertained by him for several months. After their departure, his abode, says Phillips, "looked again like a house of the muses." He lived successively in the Barbican and in Holborn, and was occupied with writing his history of England when the execution of King Charles (Jan. 30, 1649)

had aroused throughout Europe a feeling of horror and indignation, and created a reactionary tendency even among the partisans of the revolution. Milton wrote "The Tenure of Kings and Magistrates," published within a month after the death of the king, in which he undertook to prove that subjects have a right to depose or put to death a wicked monarch. He also published "Observations" on the articles of peace which the earl of Ormond had concluded in the king's name with the Irish Catholics. On the establishment of the commonwealth, Latin was fixed upon as the official language of intercourse with foreign states. To Milton, in view both of his scholarship and his services, was given the office of secretary for foreign tongues; and 16 letters and other documents first published by the Camden society in 1859 confirm all previous impressions of his skill in Latin composition, and of the eloquence, energy, and dignity he gave to the political despatches of the commonwealth. He vindicated the freedom of England on the seas, protested against the persecution of the Waldenses by the duke of Savoy, and expounded to Europe the position and policy of the new government. The *Eikon Basilike* was passing through numerous editions, and winning popular sympathy for the "royal martyr," and he therefore prepared a counteractive under the title of *Eikonoklastes* (1649). Claude de Saumaise (Salmasius), one of the most distinguished contemporary scholars, was instigated by Charles II., then a refugee in Holland, to compose an elaborate defence of the inviolability of kings, and especially of royalty in England, in a treatise worthy to be submitted to the learned of Europe. The name of the author was sufficient to secure fame and extended influence to his work, and the council immediately made an order "that Mr. Milton do prepare something in answer to the book of Salmasius." This was the occasion of his *Pro Populo Anglicano Defensio contra Salmasii Defensionem Regiam* (1650), in which he assailed at once the philosophy and Latinity of his opponent, and surpassed him in scholastic vituperation. It was deemed a triumph, and he received the thanks of the council and the congratulations of the foreign ministers in London. His eyesight had been failing for several years, and his physicians informed him before he undertook this defence that total blindness was threatened; but he regarded the task as a sacred duty, and it hastened the malady, the "drop serene" (*gutta serena*), as it is termed in his plaintive account of it. Before 1654 he was completely blind, though his eyes were perfectly clear, and without mark, speck, or disfigurement. He had already removed to the house in Petty France, opening into St. James's park, in which he remained till the restoration, and which was afterward occupied by Hazlitt. In 1652 appeared *Regii Sanguinis Clamor ad Cælum*, written by Dumoulin, a Frenchman resident in England, but attrib-

uted to Moore (Morus), a Scotchman resident in France, abounding in calumnious invective against Milton personally. This occasioned his *Defensio Secunda* (1654), a noble defence of his own conduct, a vindication of the parliament, and a merciless retaliation for the scurrilities of his antagonist. The dispute was prolonged by two additional pamphlets on each side. Milton continued to write many of the more important state papers until the year of the restoration, and was also occupied with his history of England, with framing a body of divinity, and perhaps with the composition of his great poem, the subject of which he had at length determined. He also opposed to the last in divers tracts and letters the return of the monarchy. For 20 years he had been the foremost literary champion of the principles of English liberty, then struggling for recognition. His polemical writings abound in passages of the finest declamation, marked by a peculiar majesty of diction, and by a sustained and passionate magniloquence. The political theory which he advanced was in some respects peculiar to himself. He advocated a free commonwealth, without a sovereign or a house of lords. The government should be intrusted to a general council of ablest men, chosen by the nation, and he opposed the co-existence of any popular assembly. He would not even have the members of the council chosen directly by a popular vote, but recommended three or four "sifting and refining" processes. After the restoration, a proclamation was issued for the arrest of Milton, and two of his books were publicly burned. He lived in concealment till the act of indemnity placed him in safety. His first wife had died in 1652 or 1653, leaving him three little girls; he married a second time, Nov. 12, 1656, Catharine, daughter of a Captain Woodcock of Hackney; but his wife, whose memory is embalmed in one of his most beautiful sonnets, survived only 15 months; and about 1663 he married Elizabeth Minshull, daughter of Ralph Minshull of Cheshire. The last was a marriage of convenience, arranged by a friend, because his daughters had ceased to treat him with kindness. They however lived in his house five or six years longer, in constant quarrel with their stepmother. Unsubdued by pain, obloquy, and blindness, amid domestic infelicities and the profligacy of the era of the comic dramatists, and witnessing the public defeat of the principles which he had represented, he meditated and dictated the poems of "Paradise Lost" and "Paradise Regained." According to Ellwood, the former was completed and the latter was begun at Chalfont, whither Milton retired from London during the plague of 1665. "Paradise Lost" was sold to Samuel Simmons, bookseller, April 27, 1667, for £5 in hand, and a promise of the same sum on the sale of the first 1,300 copies of each edition, none of which was to exceed 1,500 copies. The second payment was received in 1669, the

second edition was issued in 1674, the third in 1678, and in 1681 Milton's widow gave up to Simmons all her interest in the work for £8. This poem has been the subject of a great deal of criticism and research. Disraeli, in his "Amenities of Literature," has pointed out its remarkable similarity to the work of Cædmon, an Anglo-Saxon poet; others attempt to trace the character of Satan to Vondel's *Lucifer*, and cite a recently discovered record of Leyden university (1874), which shows that Milton studied there, and probably acquired some knowledge of contemporary Dutch literature. "Paradise Regained" appeared in 1671, in the same volume with the drama of "Samson Agonistes." A second and enlarged edition of his minor poems was published in 1673. His principal later prose publications are the "History of Britain" (1670), down to the Norman conquest, containing many of the early traditions, much of which had been written before the restoration; a tract entitled "Of True Religion, Heresie, Schism, Toleration, and what best Means may be used against the Growth of Popery" (1673), in which he urges absolute toleration for all Protestant sects, but denies it to Roman Catholics; a short Latin grammar (1661); a compendium of logic (1672); and his Latin epistles and oratorical exercises in the university (1674). He left in manuscript a Latin treatise entitled *De Doctrina Christiana*, which had been unsuccessfully offered to Elsevir for publication. Two years after his death it came into the hands of one of the English secretaries of state, by whom it was deposited in the state paper office, where it was accidentally discovered in 1823. It was translated and edited (4to, 1825) by O. R. Sumner, D.D., afterward bishop of Winchester, and it completely establishes Milton's Arianism, which had been suspected from passages in "Paradise Lost." Its heterodoxy was doubtless the reason why it was offered first to a Dutch publisher, and afterward withheld from the public. In his last years he was afflicted by the gout, which, according to Aubrey, "struck in" and caused his death. He died calmly and without pain, and his remains were laid beside those of his father in the church of St. Giles, Cripplegate. After his sight failed he had been accustomed to go to bed at 9 o'clock, and to rise at 4 in summer and 5 in winter. Before rising, he often had some one to read to him or to write at his dictation. He studied till 12, with the intervention of breakfast, then exercised for an hour, dined, played on the organ or bass viol, and resumed his studies till 6, from which hour till 8 he conversed with visitors. He fancied that "his vein never happily flowed but from the autumnal equinox to the vernal," and was never satisfied with what he wrote in the other half of the year. He attended no church, belonged to no religious communion, and never had social prayers in his family. That he was somewhat haughty and overbearing, and of severe if not choleric

temper, appears from other evidence as well as from passages in his controversial writings; yet his manners were usually urbane, and his conversation delightful.—The principal biographies of Milton are those by Toland, Todd, Symmons, Dr. Johnson, Mitford, Keightley (London, 1859), and Masson (2 vols., London, 1859-'71). The last is also a literary history of the time. The best edition of Milton's poetical works is Pickering's, with a life by the Rev. John Mitford (8 vols., London, 1851; the 2 vols. of poems reprinted, with Mitford's "Life," 1873). Among others are those of Bishop Newton (3 vols. 4to, 1749), the first critical edition; Todd, with variorum notes (6 vols., 1801); Hawkins (4 vols., Oxford, 1824); Sir E. Brydges (6 vols., 1831); C. D. Cleveland, with a verbal index (large 12mo, Philadelphia, 1853); Keightley (2 vols. 8vo, 1859); W. M. Rossetti, with memoir (8vo, 1871); David Masson (1874); and the minor poems by T. Warton (1785). The prose works were first collected by Toland (3 vols. fol., 1697-'8), and have since been edited by Birch (2 vols., 1753), Charles Symmons (7 vols., 1806), Robert Fletcher (8vo, 1826), and Rufus W. Griswold (2 vols. 8vo, Philadelphia, 1845); but the only complete edition is in Bohn's "Standard Library" (5 vols. post 8vo, 1848-'53). A concordance to the poems by Prendergast was published at Madras in 1857. A German translation of his principal political writings (*Politische Hauptschriften*) was published in Berlin in 1874 by Dr. W. Bernhardt, with annotations.

MILUTIN, or **Milyntin**, **Nikolai Alexeyevitch**, a Russian statesman, born April 29, 1818, died in Moscow, Feb. 7, 1872. Being born on the same day with the grand duke Alexander, he was educated at the expense of Czar Nicholas, at the lyceum of Moscow, where he graduated in 1835. Nicholas then gave him a free scholarship at the university of St. Petersburg, where he completed his studies in 1838. He became supernumerary, and in 1842 vice president, of the imperial chamber of court accounts. In 1844 he was appointed chief of the press bureau, which post he soon left to undertake the revision of the Russian municipal laws. The czar next appointed him a member of the committee on the condition of the Russian serfs. Though Nicholas did not venture to act upon Milutin's advice in favor of emancipation, he appointed him under secretary of the interior. After the accession of Alexander II. (March 2, 1855), Milutin became his confidential adviser. He countersigned the ukase of emancipation, March 3, 1861, and prepared the laws necessary for this reform. He was made minister of the interior, and the new criminal code, the press law, and the introduction of the jury system are chiefly his work.

MILWAUKEE, a S. E. county of Wisconsin, bounded E. by Lake Michigan; area, 240 sq. m.; pop. in 1870, 89,930. It is watered by the Milwaukee, Menominee, and Root rivers. The surface is undulating, and the soil calcareous

and fertile. The chief productions in 1870 were 238,132 bushels of wheat, 48,271 of rye, 169,996 of Indian corn, 297,874 of oats, 54,973 of barley, 214,916 of potatoes, 13,779 lbs. of wool, 647,590 of butter, and 25,069 tons of hay. There were on farms 4,577 horses, 6,757 milch cows, 3,628 other cattle, 5,796 sheep, and 7,944 swine. There is a large number of manufacturing establishments, situated chiefly in Milwaukee, the capital.

MILWAUKEE, the chief city and port of entry of Wisconsin, capital of Milwaukee co., on the W. shore of Lake Michigan, in lat. 43° 2' N., lon. 87° 54' W., 75 m. E. of Madison, and 85 m. N. by W. of Chicago; pop. in 1840, 1,712; in 1850, 20,061; in 1860, 45,246; in 1870, 71,440, of whom 33,773 were foreigners, including 22,599 natives of Germany, 3,784 of Ireland, 1,435 of Bohemia, and 1,395 of Scotland.

There were 14,226 families and 13,048 dwellings. The population in 1874 was estimated by local authorities at from 95,000 to 100,000. The lake opposite the city makes an indentation in the shore, forming a bay 6 m. wide and 3 m. deep, which is easy of access at all seasons. The Milwaukee river, which flows through the city, and is joined near its mouth by the Menominee, has been rendered navigable to the heart of the city by vessels of any tonnage used on the lakes. It is regarded as the best harbor on the S. or W. shore of the lake. The climate is peculiarly bracing and healthful, and the atmosphere is remarkably clear and pure. The city is regularly laid out. The centre, near the Milwaukee and Menominee rivers, is the business quarter; and the E. and W. parts, the former of which is built upon a high bluff overlooking the lake, while the latter is still



Milwaukee.

more elevated, are occupied by residences. The material used in building is largely the beautiful cream-colored Milwaukee brick. The streets, except those in the commercial quarter, are generally well shaded. There are three lines of horse cars. The principal public buildings are the new county court house, the United States custom house and post office building, the academy of music, the opera house, and music hall. Milwaukee has railroad communication with the iron mines of Michigan, with the principal points of Wisconsin, with Chicago, St. Paul, and the railroad system of the east and west, by means of the Milwaukee and St. Paul, the Western Union, the Chicago and Northwestern, the Wisconsin Central, and the Milwaukee, Lake Shore, and Western lines. The receipts and shipments by these lines and by the lake are of great extent and value;

wheat and flour are the most important items. The number of vessels entered in the customs district (which includes the entire lake shore of the state) from Canada, for the year ending June 30, 1873, was 49, with an aggregate tonnage of 14,435; cleared for Canada, 135, tonnage 39,324; value of imports, \$222,055; of exports, \$3,018,906. The value of goods received under the act of 1870 permitting shipments in bond from the ports of first arrival to interior ports was \$76,532. The entrances in the coastwise trade were 2,979 steamers, of 2,026,054 tons, and 4,722 sailing vessels, of 553,925 tons; clearances, 2,943 steamers, of 2,011,550 tons, and 4,432 sailing vessels, of 545,193 tons; belonging in the district, 235 sailing vessels, of 36,252 tons, and 58 steamers, of 13,867 tons; built during the year, 37 vessels, of 3,493 tons. The number of arrivals at

Milwaukee alone during 1873 was 5,561, of 2,323,786 tons; departures, 5,535, of 2,233,857 tons; belonging to the port at the close of the year, 120, with an aggregate tonnage of 23,276. There are several vessels engaged in the lake fisheries. The receipts and shipments of flour and grain to and from the city since 1860 have been as follows:

YEARS.	FLOUR, BARRELS.			WHEAT, BUSHELS.		OTHER GRAIN, BUSHELS.	
	Received.	Manufactured in the city.	Shipped.	Received.	Shipped.	Received.	Shipped.
1860.....	805,203	202,510	457,843	9,108,453	7,563,608	497,544	189,676
1861.....	513,300	250,256	674,474	15,930,706	13,300,495	406,716	87,715
1862.....	529,600	221,729	711,405	15,930,995	14,915,650	846,133	259,834
1863.....	453,424	158,818	608,526	18,435,419	12,387,620	1,665,390	1,138,083
1864.....	295,225	137,899	414,383	9,147,274	8,992,479	1,808,285	959,759
1865.....	389,771	212,329	467,576	12,043,659	10,479,777	1,222,049	473,666
1866.....	495,901	323,790	720,366	12,777,557	11,634,749	8,142,086	2,391,420
1867.....	502,253	546,000	921,663	12,528,464	9,598,452	2,273,813	1,016,385
1868.....	567,353	624,380	1,017,393	12,750,578	9,378,090	2,071,867	1,066,735
1869.....	607,763	431,511	1,220,053	17,745,293	14,272,799	1,661,516	644,271
1870.....	824,799	530,049	1,225,941	18,883,337	16,127,833	1,849,990	845,179
1871.....	796,732	567,893	1,211,427	15,656,611	13,409,467	8,613,743	1,977,411
1872.....	834,202	560,206	1,231,986	13,613,949	11,570,575	5,594,555	4,057,916
1873.....	1,254,321	634,102	1,805,200	23,457,987	24,994,266	4,270,557	2,132,323

The receipts of other grain in 1873 included 921,391 bushels of Indian corn, 376,634 of rye, 1,763,058 of oats, and 1,209,474 of barley; shipments, 197,920 bushels of Indian corn, 255,928 of rye, 990,525 of oats, and 688,455 of barley. There were also received during that year 3,650,194 lbs. of butter, 203,416 hides, 59,969 sheep skins, 241,099 live and 158,955 dressed hogs, 17,262 beef cattle, 11,745 sheep, 136,017,000 ft. of lumber, 93,233,000 shingles, 11,058,000 ft. of lath, 239,877 tons of coal, 222,961 barrels of salt, 2,681,927 lbs. of rags, 5,022,840 of Wisconsin tobacco, and considerable quantities of hops, cranberries, peas, beans, cheese, eggs, &c. There were shipped 2,842,501 lbs. of butter, 3,133,042 of wool, 54,334 hides, 17,997 live hogs, 10,261 beef cattle, 10,291 sheep, 4,216,420 lbs. of Wisconsin tobacco, 137,111 barrels of salt; 80,010 barrels of pork, 24,054 tierces of hams, 62,211 boxes of middles and sides; 1,915,610 lbs. of bulk meat, 4,065 barrels and 24,399 tierces of lard, 5,365 barrels and 462 tierces of beef, equivalent in the aggregate to 329,267 barrels of 200 lbs. each, and valued at not less than \$5,000,000; and (by rail) 29,791,465 ft. of lumber, 24,097,150 shingles, and 630,400 ft. of lath. The storage accommodations for grain, comprising five elevators with a combined capacity of 2,450,000 bushels, have been inadequate for the trade; but in 1874 a new elevator with a capacity of 1,000,000 bushels was erected. Pork packing, in which six firms are engaged, is extensively carried on. The number of hogs packed in the regular packing season (Nov. 1 to March 1) of 1873-'4 was 296,142, of an average net weight of 204 lbs. The manufactures are extensive, and embrace lager beer (which is highly esteemed and widely exported), pig iron, iron castings, flour, leather, malt, machinery, agricultural implements, highwines, tobacco and cigars, furniture, brooms, paper, woollens, wagons, soap and candles, doors and windows, boots and shoes, steam boilers, car wheels, baskets, trunks, and white lead. The product

of the blast furnaces and rolling mills for 1873 was valued at about \$3,500,000; of the flouring mills, \$5,000,000; of the breweries, \$2,600,000; of the distilleries, \$1,500,000; and of the tanneries, \$3,000,000. The Milwaukee iron company is engaged in the manufacture of pig iron, railroad iron, and other kinds of merchant iron; the Minerva furnace company produces pig iron. The receipts of ore were 103,427 tons, shipments 26,940; receipts of pig iron, 11,457 tons; manufactured in the city, 35,120 tons; shipped, 8,330 tons; receipts of railroad iron, 6,099 tons; manufactured in the city, 34,494 tons. The number of breweries is about 20; quantity of beer sold in 1873, 260,120 barrels; distilled spirits or highwines manufactured, 29,207 barrels, of which a considerable portion was redistilled and converted into alcohol. There are 13 mills, which, besides the flour, produced more than 46,000,000 lbs. of bran and middlings, and three ship yards. The number of hides tanned was 149,082. In 1874 there were four national banks, with an aggregate capital of \$750,000; circulation, \$657,400; deposits, \$2,808,752 53; resources, \$4,706,225 23. There were four state banks, with an aggregate capital of \$266,325; deposits, \$2,480,196 79; resources, \$4,427,011 50. The two savings banks had a joint capital of \$125,000; deposits, \$1,403,989 97; resources, \$1,553,955 77. There are four private banks, four fire insurance companies, and one life insurance company. The aggregate receipts of the banks in 1873 amounted to \$451,686,356 90, which sum is regarded as a fair indication of the total volume of business of all kinds transacted in the city during that year.—Milwaukee is divided into 13 wards, and is governed by a board of aldermen of one member and a common council of two members from each ward. There is a municipal court, presided over by a single judge. The police force consists of a chief, two lieutenants, four detectives, two station keepers, a pound keeper, and 40 patrolmen. The fire department has five steam fire engines

and a fire alarm telegraph. The city is supplied with water from the lake by water works recently erected. The United States courts for the E. district of Wisconsin hold two sessions here annually. The assessed value of property in 1873 was \$48,559,817; expenditures for general purposes, \$395,392 97; total debt April 1, 1874, \$2,464,986 74. The northwestern national asylum for disabled soldiers is about 3 m. from the city. It occupies a brick building, having accommodations for 700 or 800 inmates, with which are connected shops and stables. The grounds embrace 425 acres, more than half of which is under cultivation, the residue being laid out as a park. The institution has a reading room and a library of more than 2,500 volumes. The present number of inmates is about 400. In the city there are three orphan asylums, a home for the friendless, and two hospitals. The public schools, 21 in number, are graded, and include a high school. In 1873 there were 38 male and 127 female teachers employed; number of pupils enrolled, 11,224; average attendance, 7,100. The number of private schools was 47, with 7,000 pupils. Milwaukee female college had 6 instructors and 118 students, of whom 44 were of collegiate grade. The library of the young men's association contains 11,000 volumes, and that of St. Mary's institute 1,000. There are 8 daily (4 German), 1 tri-weekly, 2 semi-weekly, and 16 weekly (6 German) newspapers, and 1 semi-monthly (German) and 5 monthly (1 German) periodicals. The number of churches is 59, viz.: 3 Baptist, 1 Calvinistic Methodist, 1 Christadelphian, 5 Congregational, 1 Dutch Reformed, 5 Episcopal, 4 Evangelical Association, 1 German Reformed, 2 Jewish, 10 Lutheran, 1 Lutheran Reformed, 9 Methodist Episcopal, 5 Presbyterian, 10 Roman Catholic, and 1 Unitarian.—Milwaukee was settled in 1835, and incorporated as a city in 1846.

MILYAS. See LYCIA.

MIMNERMUS, a Greek poet, born in Smyrna, flourished from about 634 to 600 B. C. Descended from a colonist from Colophon, he was called the Colophonian. He was a flute player as well as a poet, and set his poems to music, using the plaintive melody called the *vousē kradiaēs* (melody of the heart). He fixed the form of elegiac poetry, and has been called its inventor. The most important of the surviving fragments of his works is his celebrated poem *Nanno*, the most ancient erotic elegy of Greek literature. They have been published separately by Bach (Leipsic, 1826), and have been translated into German by several distinguished authors. The best edition of his works is by Schneidewin, in the *Delectus Poetarum Elegiacorum Græcorum* (Göttingen, 1838).

MIMOSA (Gr. *μῖμος*, a mimic, as some of the plants imitate the movements of animals), a genus of *leguminosæ* which is so unlike in structure to the majority of the order as to serve as a type of a suborder, the *mimosææ*. These have small regular flowers in a spike or

head, with stamens twice as many as the petals and leaves (sometimes simple phyllodia), twice or thrice pinnate. The genus *mimosa* was originally very large, but it has been so subdivided that now it includes only about 200 species, which are herbs, under-shrubs, or climbers, very few being erect shrubs or trees. The best known species is the sensitive plant (*M. pudica*), noticeable for its irritable leaves; others in the genus possess the same property, but in a less marked degree, and in all the leaves fold and take a sleeping position at night. The sensitive plant is a native of Brazil, and has been in cultivation more than 200 years; it is usually treated as an annual, when it grows only about a foot high, but if kept under glass it will grow 3 ft. high or more, and form a straggling shrub with weak spiny branches which are beset with bristly hairs; the alternate leaves are bipinnate, with usually four pinnae, each bearing numerous small



Sensitive Plant (*Mimosa pudica*).

leaflets; the flowers are in small rose-purple heads, and are succeeded by short bristly pods containing the seeds; these retain their germinating power for a long time, in illustration of which it is mentioned that the *jardin des plantes* has been continuously supplied with sensitive plants by seeds from a bag that was brought there more than 75 years ago. It is sparingly naturalized in Florida. The sensitiveness of the foliage of this plant, manifested by a peculiar shrinking when touched, is one of the most striking phenomena of plant life; when undisturbed and in a bright light, the leaves stand nearly at right angles to the stem, but a slight touch causes them to fold and droop as if dead. This change in the position of the leaf is completed in three successive movements: first the leaflets close in pairs, bring their faces together, and incline forward; then the secondary petioles or branches of the leaf approach each other; and finally the main leaf

stalk turns directly downward, bending at its union with the stem; left to itself, the collapsed leaf gradually resumes its former position. The sensitiveness of the leaves is affected by the temperature, being greatest on warm days; if the plants are exposed to the action of the wind, their irritability is notably diminished. No explanation is given of this phenomenon, but it is regarded as an unusual development of the power of motion which is possessed in a less manifest degree by a large number of other plants.—*M. strigillosa*, of Florida and the far south, along the banks of rivers, is a prostrate sensitive species with large leaves. Another of the genus, *M. sensitiva*, not rare in greenhouses, has only one pair of leaflets to each pinna; these are many times larger than those of the sensitive plant, and droop when touched, but much less promptly than the other. Several other mimosas are cultivated as ornamental greenhouse plants, but none of them have any economical importance.—The sensitive plant of the southern states (more properly sensitive brier), which is found from Virginia to Texas, formerly regarded as a single species of *mimosa*, is now found to be sufficiently distinct to be placed in a separate genus, *Schrankia*, and two species are distinguished, *S. uncinata* and *S. angustata*, differing mainly in the form and reticulation of their leaflets; they are nearly prostrate herbs, with stems 3 or 4 ft. long and armed with hooked prickles; the leaves are bipinnate, and the flowers in small, globular, rose-purple heads; the foliage is sensitive, but only under much rougher handling than is required to affect the sensitive plant. On the prairies of the far south this plant often covers the ground for wide stretches, and by the closing of its leaves shows for a while the trail of the traveler very distinctly.

MINA BIRD. See MINO BIRD.

MINAS GERAES, an inland province of Brazil, bounded N. by Bahia, E. by Bahia, Espírito Santo, and Rio de Janeiro, S. by Rio de Janeiro and São Paulo, and W. by Goyaz; area, about 230,000 sq. m.; pop. in 1871, 1,450,000. The face of the country is extremely irregular. Several mountain chains traverse it, especially in the south and west, sending out spurs and minor ridges which cross the province in every direction, and are separated by extensive and fertile valleys, watered by large rivers. The highest summits are Itacolumé (about 5,700 ft.) and Itambé (6,000). The principal river is the São Francisco, which divides the province into two almost equal portions. Other large rivers are the Belmonte, Mucury, Doce, Paranaíba, Grande, and Verde Grande. Many of these, as well as the São Francisco, have large tributaries, such as the Jequitinhonha and the Rio das Velhas; but none of them are navigable throughout. Minas Geraes was formerly famous for its mines (whence its name), at once the richest and most numerous in Brazil, especially the gold mines of Ouro Preto, the

capital, Morro Velho, and Minas Novas; but most of them have been abandoned, and even the washings, though known to be profitable, are for the most part unworked, agriculture or diamond washing on the Jequitinhonha being preferred. Upon the discovery of diamonds in 1746, the government, to encourage the search for these gems, prohibited the extraction of gold. Rubies have occasionally been found; *grisolitas* (chrysoberyls), *pingoas d'agua* (white topazes), and other precious stones abound in the Mucury, the Rio das Americanas, &c. Although Minas Geraes is entirely within the tropics, it has, owing to its mean elevation of about 2,000 ft. above the sea, a generally mild and healthy climate. Vegetation is everywhere luxuriant; the forests contain vast quantities of timber and valuable cabinet woods; dyes of various kinds and several species of medicinal plants abound; and whole districts, covered with brilliant flowers, presenting the aspect of continuous gardens, are not uncommon. The soil is fertile, and yields plentiful crops of the various cereals; maize, millet, manioc, and cotton are the staple productions; tobacco thrives well; and the coffee is only inferior to that of Ceará. Great numbers of cattle pasture on the plains under the care of *vaqueiros*, and the rearing of cattle and hogs is one of the principal occupations. There is a great variety of wild animals, birds, serpents, and insects. A prosperous trade is carried on with Bahia, Rio de Janeiro, and São Paulo; the articles exported are cattle, hogs, bacon, cheese, cotton fabrics, tobacco, coffee, skins, precious stones, drugs, &c. Manufactures, wine, flour, wheat, and salt are imported. With the exception of the great Union and Industry road, the facilities for transport are meagre, and goods are mainly carried on muleback, which greatly enhances the price of all articles imported. There are forges, foundries, and cotton and woollen weaving establishments in many of the towns; wool hats, rum, sugar, and tobacco are manufactured on a large scale. Besides the colleges in the principal towns, there are upward of 250 primary and grammar schools in the province.—Minas Geraes was made a province in 1833. It is divided into 14 *comarcas* or districts. The capital is Ouro Preto, formerly Villa Rica; and other important towns are Marianna, Minas Novas, Januária, Diamantina, and São João d'El Rey.

MINATITLAN, a small town of Mexico, isthmus of Tehuantepec, on the W. bank of the Coatzacoalcas, 20 m. from its mouth and 125 m. S. E. of Vera Cruz; pop. about 2,500. It has obtained some notoriety and importance from being the Atlantic point of departure in the various attempts to establish an interoceanic communication by way of the isthmus of Tehuantepec. It is also the proposed terminus of the projected railway across that isthmus to the north. The country immediately around the town is low and subject to periodical inundations. Cattle constitute the chief wealth of

the people. Mahogany and other valuable woods are produced in the vicinity, and shipped at Vera Cruz.

MINCIO (anc. *Mincius*), a river of N. Italy, which runs, under the name of Sarca, from the S. extremity of Tyrol into the lake of Garda, at Riva, issues from it at Peschiera, where it takes the name of Mincio, and flowing southward forms the boundary between the provinces of Verona and Mantua; then, past Goito, turning S. E. it expands into a lake, near the E. end of which is the fortress of Mantua; below this it discharges itself into the Po, near Governolo, after a course of more than 40 m. from the lake. It is navigable for barges throughout the greater part of its length. A battle was fought on the banks of the Mincio in 197 B. C., in which the Insures and Cenomani were defeated by the Romans. Bonaparte crossed the Mincio in May, 1796; and the Austrians under Bellegarde were defeated there by Brune, Dec. 25 and 26, 1800, and upward of 4,000 of them taken prisoners. Another victory over the Austrians was achieved there by the French under Eugène Beauharnais, Feb. 8, 1814, after a bloody conflict. In 1859 the Mincio became again the theatre of war between the allied Sardinians and French and the Austrians, the latter endeavoring to concentrate their resistance on the line of the river. After the battle of Solferino (June 24), the allied armies crossed the Mincio into Venetia, and the war was brought to a close by the peace of Villafranca (July 11), by which Lombardy was transferred from Austria to Sardinia, and the upper Mincio became a part of the boundary between the two states. This boundary ceased to exist in 1866, when Venetia was united with Italy.

MIND, Gottfried, a Swiss painter, better known under the name of Berner Friedli, born in Bern in 1768, died there, Nov. 7, 1814. He was educated in the charity school of Pestalozzi, devoting himself to the study of design. Ignorant in other education, and deformed, he shunned society, and spent his life among cats, of which he executed such excellent pictures that he was called the Raphael of cats. He also excelled in pictures of bears, children, and beggars. He died in poverty. Since his death his pictures have commanded extravagant prices, and several of them have been engraved.

MINDANAO. See PHILIPPINE ISLANDS.

MINDEN, a fortified town of Westphalia, Prussia, capital of a district of the same name, on the left bank of the Weser, 60 m. E. N. E. of Münster; pop. in 1871, 16,593. It is one of the oldest towns of Germany, is surrounded by walls with six gates, and has a garrison of 4,000 men. It contains a Roman Catholic cathedral of the 11th century, and was once the capital of the see of Minden, which was founded by Charlemagne, but was suppressed in 1648. It has a gymnasium, a normal school, manufactures of woollens, linens, leather, sugar, and tobacco, and an important trade chiefly

in grain, linen, yarn, and brandy. It was the residence of some of the German emperors, and several diets were held there. Within 2 m. of Minden the railway traverses the pass called Porta Westphalica. In a ruined chapel near it Wittekind, according to tradition, was baptized by Charlemagne. The French were defeated in the vicinity of Minden, Aug. 1, 1759, by an Anglo-Hanoverian army under Ferdinand of Brunswick.

MINDORO. See PHILIPPINE ISLANDS.

MINE, an excavation made in the earth for the extraction of minerals. When the material to be extracted is a rock of any kind, the excavation is known as a quarry. We find very little in classic literature that gives any real information about the mines of antiquity or the manner in which they were worked. It is certain, however, that the Phœnicians and Egyptians at the earliest periods of history had an abundance of metals. The Phœnicians obtained from Sardinia and from other islands of the Mediterranean gold and iron, as well as other metals; they are known to have mined in Spain, probably for lead and silver, and to have traded with the Britons for the tin ore of Cornwall and Devon. Of even greater antiquity was the mining of the Egyptians, who had mines of copper, silver, and gold in productive operation, both on the Ethiopian and the Arabian border. The Sinaitic desert contains the ruins of mining works, probably executed by the Egyptians. Abraham found gold and silver in use among them. In the time of Alexander gold, silver, copper, and iron were obtained in Ethiopia, and iron, at least, in Libya. India and Caramania (modern Kerman) produced gold, and the latter country also silver and copper. In Asia Minor the gold mines formerly owned by Cræsus were worked down to the time of Xenophon, but Strabo says that in his day they were exhausted. There were iron mines and skilled workmen in Palestine. Ancient writers speak of rich gold and silver mines in Arabia Felix, no traces of which remain. The Athenians worked rich silver mines in Attica and gold mines in Thrace and Thasos. Thessaly produced gold, Bœotia iron, and Epirus silver. Before the time of the Romans mining was carried on in many parts of western Europe. The Etruscans and the Sabines in Italy were acquainted with copper, and the former discovered iron in Elba. The northern tribes of Italy obtained gold by washing; the tribes of Gaul are known to have mined for gold, silver, copper, and iron; and in Spain and Sardinia extensive and productive mines were established by the Carthaginians. Britain produced gold, silver, iron, lead, and tin. After the conquest of Cæsar, the tin of Cornwall was shipped first to the Isle of Wight, and thence to the coast of Gaul, where it was loaded upon horses and transported to Marseilles, a journey of 30 days. The early Romans did not work the mines of their native land. The first two Punic wars delivered into

the power of Rome the important mines of Sardinia, Sicily, and Spain. Subsequent conquests added those of Asia Minor, Macedonia, and Greece, and still later the remaining mines of western Asia and those of Egypt were acquired by the armies of Pompey and Augustus. Those of Gaul yielded to Cæsar. The tin mines of Britain were their latest conquests of this sort, and Rome was then mistress of all the important mines of the ancient world. Under the republic the mines were worked by lessees, who employed numbers of slaves, and subjected the mineral deposits of the provinces to rapid and reckless robbery. During the period from the first Punic war to the empire there was an immense production of metals, and many of the mines were exhausted. The emperors established governmental supervision, and worked the mines through regularly appointed officials. Mining in the countries belonging to the West Roman empire declined rapidly from the 3d century, and after the 5th it ceased entirely. The Byzantines gradually surrendered their mines to the Arabs; those of Asia Minor, Thrace, and Greece were the last which the eastern empire retained.—Mining is known to have been carried on at Andreasberg in the Hartz since the year 968. The famous Rammelsberg mines were discovered in 972 by the pawing of a steed named Rammel, tied to a tree in the forest. The Freiberg district was discovered about 1165, and has been steadily worked since 1547. Traces of ancient mining in the United States are confined to the copper region of Lake Superior, and to certain districts in New Mexico. In both cases the implements seem to have been rude hammers of stone. In New Mexico there is a large excavation known as the Turquoise mine, from which a trachytic rock, carrying turquoise in seams, has been laboriously extracted by a race of whom not even a tradition now exists. In ancient times muscular force, assisted only by applications of fire and occasionally by the power of water, was the miners' resource. A most suggestive picture of rude mining operations is given in the book of Job, xxviii. 1-11, of which Conant's translation brings out the beauties very strikingly: "For there is a vein for the silver, and a place for the gold, which they refine. Iron is taken out of the dust, and stone is fused into copper. He puts an end to the darkness; and he searches out, to the very end, stones of thick darkness and of death-shade. He drives a shaft, away from man's abode; forgotten of the foot, they swing suspended, far from men! The earth, out of it goes forth bread; and under it is destroyed as with fire. A place of sapphires, are its stones; and it has clods of gold. The path, no bird of prey has known it, nor the falcon's eye glanced on it; nor proud beasts trodden it, nor roaring lion passed over it. Against the flinty rock he puts forth his hand; he overturns mountains from the base. In the rocks, he cleaves out rivers; and

this eye sees every precious thing. He binds up streams that they drip not; and the hidden he brings out to light." Pliny ("Natural History," xxxiii., 4) gives a similar description of shaft-sinking operations: "Elsewhere pathless rocks are cut away, and are hollowed out to furnish a rest for beams. He who cuts is suspended with ropes. . . . For the most part they swing suspended, and fasten up lines for a pathway. They go where there is no place for the footprints of man." The removal of surface material by sluicing was also practised in ancient times in Spain.—The operations of mining may be comprised under four heads: 1, the discovery of mineral deposits and the testing of their value; 2, the establishment of access to such deposits; 3, the extraction of the mineral; 4, the protection of the works and workmen. I. DISCOVERY AND TESTING OF MINERAL DEPOSITS. For a description of the modes of occurrence of the rocks and minerals which are objects of mining, see MINERAL DEPOSITS. The presence of such deposits is indicated by various signs. Sometimes the veins themselves, if harder than the enclosing rocks, crop out at the surface unaltered. More frequently the outcrop is indicated by decomposed rock, which when ferruginous is called "gossan." Loose pieces of gangue and ore, known to western miners as "float quartz," and found upon the surface and in the soil, frequently lead to the discovery of veins. The lead miner of the limestone districts of the Mississippi valley is guided by depressed lines upon the surface, indicating the existence of fissures. The magnetic needle is employed in the discovery of certain ores of iron, and the ancient superstition of the divining rod for the discovery of hidden springs and mineral veins is not yet extinct even in this country. (See DIVINING ROD.) When the neighborhood of a mineral deposit is suspected and no certain indication of its exact locality appears, it is sought by prospecting pits, cuts, drifts, or borings. Prospecting pits are commonly dug upon the supposed outcrop of a deposit, to test its dimensions and quality. Open cuts are usually run on the surface at right angles to the prevailing course of the veins of the district, and are excavated down to the solid rock for the purpose of exposing the veins which they may cross. This is called "costeening." Boring is employed for determining the character of rock strata, and the position of mineral deposits in them. It has been usually applied to coal beds or to strata containing salt or petroleum deposits. In the latter cases the bore-holes subsequently serve for the extraction of brine or oil. The invention of the diamond drill (see BORING), by means of which holes can be driven in advance horizontally for hundreds of feet, has greatly enlarged the applications of boring as a means of exploration. Horizontal adits, or crosscuts, driven into the sides of hills at right angles with the veins known to exist in them, are the

surest but most expensive method of exploration. It may be resorted to when the existence and value of the deposits are well known, and the topography is such that the entry may subsequently be valuable for drainage and transportation. Finally, new deposits may be discovered under ground by driving experimental openings from mines already in operation.

—The value of deposits is tested by shafts and drifts, usually excavated within the deposit itself. The construction of such works in the barren rock is seldom undertaken until the vein is found to be worthy of the expenditure. In the case of coal, building stone, iron ore, and, in general, all materials which occur in extensive and tolerably uniform deposits, and the value of which is small in comparison with their bulk, the test of quality is not difficult. But minerals of more concentrated value usually occur mixed with such variable proportions of "gangue" or barren matter, and when in fissure veins are subject to such variations in width and course, as to render it necessary to expose considerable bodies of vein matter, and to make tests either by thorough sampling or by actual reduction of large quantities, before the economical value of the deposits can be ascertained. By connecting with the shafts or inclines sunk upon the dip of the vein longitudinal drifts run upon its course, this object can be measurably secured. Alluvial deposits, such as those of gold and stream tin, are tested by actual working with pan, sluice, &c. When large operations, like those of hydraulic mining, are contemplated, the body of earthy gravel, cement, &c., if its value is not already known, is tested by shafts sunk to the bed rock at a sufficient number of points to give an indication of its average contents. II.

APPROACHES TO MINES. Access to mineral deposits for permanent exploration is established, first by suitable wagon or tram roads on the surface, and secondly by either stripping the overlying soil and rock from the deposit itself, as is done in quarries, clay banks, and some iron mines, or by sinking a shaft or running a drift or crosscut from the surface into the deposit. In the case of beds or veins which dip at a convenient and uniform angle, the shaft may be carried down upon the deposit itself, and is then usually called a slope or an incline. For less regular deposits, and for those in which the angle of inclination is inconvenient or variable, or the vein matter is too valuable to permit the leaving of it in pillars to protect the shaft, it is better to drive a vertical shaft at some distance from the outcrop, in the hanging wall, so as to strike the vein at a considerable depth. A gallery run from the surface in a nearly horizontal line, to effect access and drainage, is called an adit or entry, and in some situations, as at the base of steep hills, this may be made the principal feature at the mine, the main workings being carried on through it until the vein is exhausted above its level. Sometimes the nature

of the shafts permits the opening of mines at different levels, by means of adits. This system was most highly esteemed before the improvements in machinery and the introduction of steam favored the economy of mining in deep shafts. When adits must be driven for long distances through hard and barren rocks, it is sometimes difficult to decide whether the cost of their construction will be repaid by the saving in hoisting, drainage, and mechanical ventilation. Adits are usually called tunnels by miners of the Pacific states and territories, but this is a misnomer, as a tunnel proper extends entirely through a hill. Mining shafts are generally rectangular in section, and range in size from 3 or 4 ft. to 6 ft. on the shorter sides, and from 6 ft. to 20 ft., or even more, on the longer sides. This form facilitates timbering, and at the same time permits the best utilization of space, through the division of the shaft by partitions into separate compartments for pumps, hoisting, ladder ways, &c. Adits are placed with reference to securing the greatest depth below the surface by running as short a distance as possible, particularly in barren rock; with reference to the presence of a good place for a "dump" at the adit mouth; and also with reference to easy escape of waters, freedom from flooding by freshets, and facility of natural ventilation when the adit is to be connected with a shaft. For the latter purpose it is well that the adit mouth should not be in a narrow ravine or in the corner of a valley. Dimensions of adits depend upon the amount of water expected to run in them and the other purposes to which they are to be put. When in barren rock, it is an object to make them as small as practicable; 7 ft. high and 5 to 6 ft. wide is a convenient size. But when transportation is to be carried on and double tracks are to be laid, the dimensions must be increased. The height of the adit available for passage is diminished by the water channel, which usually runs under the floor or in a ditch at one side. The grade of adits is determined with reference to the amount and character of the water flowing in them and the speed which it is desirable to give to the current. The ancient mining regulations of Prussia required of deep adits a grade of from 1 in 800 to 1 in 400. Some of the adits at the coal mines of Saarbrück rise at the rate of 1 in 1,600; others at the rate of 89 in 64,000. According to the Saxon law, the grade may vary between 3 in 10,000 and 1 in 1,000. The long Ernst August adit in the Hartz has, for a length of nine miles, an average grade of 0.67 in 1,000. Here the water in the adit is itself used for transportation, and the current is intentionally kept slow. Access is further obtained to the different parts of the mineral deposit by subordinate shafts and galleries excavated in the deposit. These interior shafts not extending to the surface are known as winzes, and usually serve to connect the galleries on different levels. The galleries are known

as levels or drifts in vein mining, and gangways in coal mining. When a mine is opened by a vertical shaft, the vein is sometimes cut by a crosscut level run from the shaft through barren rock, at a point higher than the intersection of the shaft and the vein. From the point where the crosscut enters the vein, levels are then run in both directions horizontally on the vein. After the main shaft has reached the vein and has been carried through it, the distance between vein and shaft of course grows larger with increasing depth, and the vein must be again opened by crosscuts from the shaft at different levels. The levels opened in the vein are so many parallel roads on the vein, succeeding each other every 60 to 100 ft. in depth. The winzes connecting them serve both in ventilation and in extraction, besides affording convenient access to different parts of the mine. The running of drifts to make connection with old and abandoned workings is sometimes dangerous, when the old workings are full of water and their exact position is not known by surveys. In such a case the approach is made cautiously, and a bore-hole is kept in advance, to tap the accumulated waters in such a way as to avoid an excessive flow or give the workmen time to escape. An accident of this kind at the Gouley mine, near Aix-la-Chapelle, in 1835, which caused the drowning of 63 miners, gave rise to the publication by the government of the Rhenish province of exact regulations, which constitute an excellent guide to the mining engineer.

III. **EXTRACTION OF MINERALS.** To perform the work of regular extraction with due economy and safety, the following circumstances must be considered: the shape of the deposit, as a tabular or sheet deposit, a mass or stockwork, regular or irregular, &c., and if a tabular deposit, like a fissure vein or a bed, then its course and dip, its folds, basins, faults, and breaks; the thickness and inner structure of the deposit, or, in ore veins, the nature and distribution of the ore bodies, the amount of barren gangue, and in coal beds and other deposits the proportion of marketable to waste material; the character of the "country" or wall rock, as making a solid or a precarious roof, and requiring more or less support; the number, relation, and distance apart of several deposits which it may be desirable to work at once or successively, as for instance seams of coal, lying one under the other; the conditions of ventilation, particularly where explosive gases are to be feared; the conditions of drainage; the character, abundance, and price of materials for underground supports (timber, masonry, iron pillars, loose rock, or earth); the size and shape of the pieces of material to be extracted (commercially important in coal and quarried stone); the method of excavation to be employed (picking, shovelling, fire setting, hydraulic sluicing, leaking, blasting, &c.); and finally, in a subordinate degree, the nature of the mineral itself, as for instance very rich and

brittle silver ore, which is liable to be lost in fine particles among the piles of waste, or some kinds of coal which deteriorate by standing too long in the mine after they have been exposed and drained, or clays which become like quicksands in contact with water. Any one of the foregoing conditions may, under certain circumstances, be decisive as to the choice of a method of extraction.—Hydraulic mining is an application of the power of water, under high pressure and at great velocity, to move great masses of material, separate the heavier and more valuable portions, and convey away the lighter waste. (See **GOLD MINING**.) In its modern form it was invented in California about 1852, and is mainly employed in that state. It has been introduced at Iron Mountain, Missouri, for the purpose of removing and concentrating the surface ore of that locality. For hydraulic mining, it is necessary to have, besides a deposit suitable to operate upon, a supply of water at a proper altitude, and an escape for the turbid stream, at a level below all the workings. The waste material is thus removed by the current at small cost, while the gold is precipitated to the bottom and caught in crevices, "riffles," &c. As most "hydraulic-gravel" deposits have been accumulated in basins of ancient river channels, they are surrounded by hard rock, called "bed rock" below, and "rim rock" where it comes to the surface at the edge of the deposit. For hydraulic exploitation, the bottom of the deposit must be under-run by a tunnel through the bed rock, and a short shaft from the overlying deposit must be connected with this tunnel. Then the bank may be "hydraulicked" down, and everything except the large boulders sluiced into the shaft and tunnel, and so away to lower grounds. The method of extraction by leaching is peculiar to certain rock-salt mines, in which the mineral is too much mixed with earthy and stony matter to be quarried. Chambers are excavated in the mass, and filled with water, which is allowed to stand until it has extracted from walls and roof sufficient salt to render it a concentrated brine. It is then drawn off, and conveyed in pipes to the boiling works. A layer from the roof of the chamber, disintegrated to a certain distance by this leaching, falls, covering the floor with material from which the salt has been extracted, and leaving a new roof exposed for a repetition of the process. Thus the chambers slowly rise through the mountain. This method is in use at Berchtesgaden in S. E. Bavaria, and Hallein in Salzburg.—Other modes of extraction are divided into two classes: those in which the space excavated is refilled wholly or partially with waste material, and those in which no such "packing" or "gobbing up" is employed. The former class is subdivided, according to the direction in which the work proceeds, into overhand stoping, underhand stoping, cross stoping, and long-wall working. (The latter method and its modifications, used chiefly in

coal mining, where the seams are not too thick, steep, or variable, may be employed either with or without gobbing up.) The word *stope* is probably a corruption of *step*, and refers to the stair-like appearance presented by the face of the excavation. Overhand stoping is conducted as follows: From the level below the ground to be exploited, a "raise" or upward shaft is driven up into the ground, and from this the different "breasts" are driven horizontally on the vein, in one or in both directions. The extraction begins at the bottom, by the excavation of a block having the width of the vein, a height of $4\frac{1}{2}$ to 9 ft., and a length of not less than 7 nor more than 30 ft. In this work two sides of the rock are always free: the upright face, toward the central shaft, and the lower horizontal side, over the level. When the breast has been driven far enough, a new workman or set of workmen may begin with a second breast, while the former still continues to advance. Fig. 1, representing the profile of a double stope, shows the order in which the work proceeds. The space behind and below the workmen is filled up with the waste rock, broken from the vein in order to get at the ore, or with rock brought from elsewhere for this special purpose. Openings or "chutes" are left in this, through which the

level below was in course of preparation; and in this work of sinking shafts and running drifts (sometimes called the "dead work" of the mine) it is not possible to multiply the

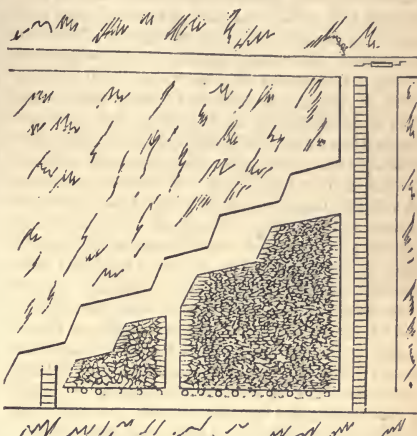


Fig. 2.—Single Overhand Stope, packed with waste rock.

number of men, so as to secure more rapid progress. Only so many men can be accommodated at the bottom of a shaft or the end of a drift; and when their effectiveness has been raised to the highest point by selecting good workmen, dividing them into three "shifts" or gangs, working eight hours each in turn, employing the most suitable tools and explosives, and, if circumstances are favorable, drills operated by steam or compressed air, the limit of practicable progress has been reached; and this determines the normal productiveness of the mine. Driving the stopes faster than the dead work is "robbing" the mine. Underhand stoping is the reverse of

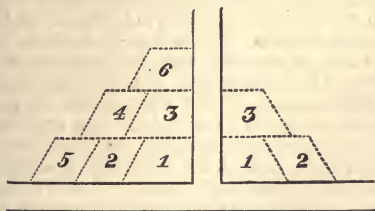


Fig. 1.—Double Overhand Stope.

ore can be allowed to fall to the level below, where it is received in cars. This level is usually protected by a roof of stulls and lagging, on which the waste rock is piled, as is shown in fig. 2; or a portion of the vein is left standing over the level, as a protection. The workmen stand on the waste rock, and stoping goes on in the manner indicated, until the whole of the valuable mineral between the bottom level and the one next above (say 60 to 100 ft., measured on the dip of the vein) has been extracted. Of course, by starting stopes at different points on the lower level, within the limits of the mining claim, or the body of valuable ore, more men can be set at work. But the regular productiveness of a mine is not susceptible of indefinite increase in this way. The maximum rate of exploitation which can be maintained until the mine is entirely exhausted, depends upon the rate at which the shaft or shafts can be sunk and new levels opened at greater depths. The too rapid exhaustion of one level would necessitate a suspension of active extraction while the next

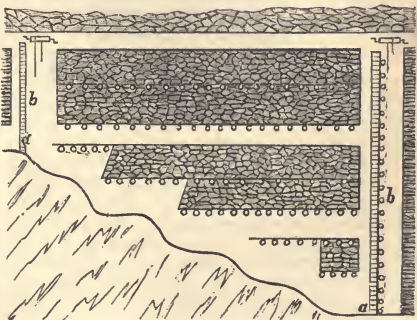


Fig. 3.—Underhand Stope.

the method just described. Here the stopes begin from the level above, and may be commenced (if the presence of water is not too troublesome) before any lower level has been

opened. The ore has to be hoisted, and the waste rock has to be lifted by hand and packed on stulls behind the miner, as shown in fig. 3. This system permits an earlier beginning of extraction, and gives the workman a firm footing on the solid vein and an easier and safer direction of working (viz., downward instead of upward). Moreover, there is less chance of losing small pieces of rich ore, which in overhand stoping get into the waste rock under foot and cannot be recovered. But overhand stoping has two great advantages: first, the convenience of rolling and dropping rock and ore, instead of hoisting them; and second, the saving of timber, which in most mining districts soon becomes expensive. The great amount of timber used in an underhand slope is not merely lost; it may give rise by its decay to slides in the packing, or the necessity of expensive repairs to prevent them. Both overhand and underhand stoping are variously modified, as for instance in their application to any thick vein in which cross stoping is not desirable. In such cases, the vein is worked in successive layers or zones, parallel with the walls, each layer beginning with that on the foot wall, being stoped out by itself, as a separate vein; 12 ft. is usually as great a thickness as can be stoped at one time with safety or convenience. Cross stoping is common in working thick veins. In this method, the vein material is removed in layers, not parallel with the walls, but extending from the foot to the hanging wall; and in each layer the exploitation takes place by driving breasts across the vein, leaving pillars between them; supporting the roof of the breast, 6 to 12 ft. wide, with timbers until

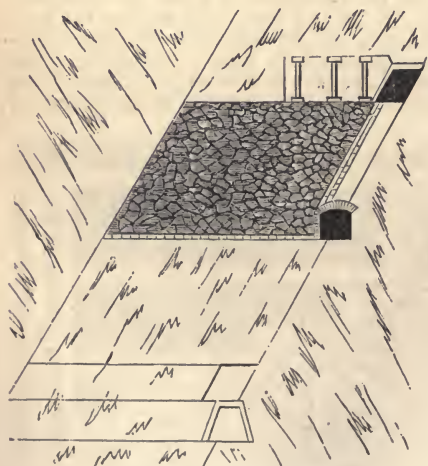


FIG. 4.—Cross Stoping.

it has reached the hanging wall; then withdrawing the timbers and packing the excavation with waste rock; and then extracting the pillars and replacing them also with

waste rock. A cross layer of the vein, 6 or 7 ft. in vertical height, having been thus removed and the space packed, the operation is repeated with the layer next above. Fig. 4 shows this method by a vertical cross section. It is employed at the quicksilver mine of Idria, Carniola, and in various modifications at the zinc mines near Aix, the coal mines of Le Creuzot and St. Etienne, in France, the mines of roofing slate near the Rhine, and the lignite mines in Lower Styria. Long-wall working is employed on nearly horizontal deposits, usually coal beds. It may be classed as retreating or advancing, according to whether the extraction begins at the borders of the field or section of the bed to be worked, and retreats toward the main shaft, or begins at the shaft and advances toward the limits. In the latter case roadways are kept through the ground already worked out. Varieties of this method are employed in the copper schist beds of Mansfeld, and at many foreign coal mines. —The methods of extraction without packing are: those in which the roof or hanging wall is supported by timbering, masonry, or pillars of the original material, left standing until the workings are to be abandoned; and those in which the roof is allowed to come down immediately after extraction. In the mines of the Comstock vein in Nevada, the spaces are kept open with elaborate timbering, framed as for immense houses. This is a great expense, besides being a source of loss and danger in case of fire. A conflagration in the Yellow Jacket, Kentucky, and Crown Point mines on that lode, which began April 7, 1869, not only cost many lives, but continued to burn, from 600 to 900 ft. underground, for many months, being sustained by the great quantity of dry timber in the stopes. —The system of extraction by breasts or chambers and pillars is practised chiefly in coal mining. It is wasteful of coal, since the pillars of that material left standing are but partially recovered by "robbing," when the breasts are worked out. It is estimated that from 30 to 40 per cent. of the coal in the anthracite mines of Pennsylvania is thus lost. —To the department of extraction belong also the various methods of transporting workmen and material. Where an adit or a slope of gentle inclination leads to the underground workings, the ore and rock are brought out in cars or wagons. For horizontal transportation men or boys, horses, mules, stationary engines, and locomotives are employed. Hoisting through shafts is performed by windlass, horse whim, or water or steam power. When the material extracted has to be lowered, as for instance to deliver it from breasts or stopes to the main roads of transportation underground, or from the shaft or adit mouth to a loading place at a lower level, gravity tramways may be employed, on which the loaded cars, descending, pull up the empty ones. The entrance and exit of workmen through shafts is effected by ladders or stairs, or by lowering

and hoisting them in cars, buckets, or cages, or by means of an ingenious arrangement called the man machine or *Fahrkunst*. Whatever method is adopted, every mine should be provided with ladders in good repair, since other means may fail at a critical moment. In its simplest form, the *fahrkunst* is a continuous piece of wood, iron, or wire rope, extending from the top to the bottom of the shaft, and provided at regular intervals (8 to 24 ft.) with small platforms, upon which a miner can stand. This frame is so placed in the shaft, and supported by counter weights (and, in inclined shafts, friction rollers), that a regular reciprocating motion, like that of the pumping rods, can be imparted to it. The machinery is so arranged that the stroke is exactly half as long as the distance between the platforms on the *fahrkunst*, and at the end of the stroke in each direction there is an instant's pause. During this instant the miner can step from the machine upon a fixed platform in the side of the shaft. As the *fahrkunst* is kept constantly running, a miner wishing to ascend by means of it has only to step upon it as it begins an upward stroke, step off at the end of that stroke, wait until the down stroke brings opposite to him the platform next above, then step upon that, and be carried another lift higher. At the same time, another miner may descend upon the same machine, by stepping on for the down stroke, and waiting during the up stroke. The double *fahrkunst* has two such frames or rods, running reciprocally side by side; and here the miner steps across from one to the other, always finding opposite to him, as the platform on which he stands pauses in its movement up or down, a platform on the other frame, just about to commence its movement in the same direction. The moving platforms are usually small, holding but one person conveniently. When two miners pass each other, one steps upon a ladder placed between the two frames. In Belgium the moving platforms are so large as to fill the whole shaft, and take several workmen at a time. The rate of working may be seen from the following statement, calculated for a shaft of 800 ft.:

FAHRKUNST.	Stroke.	Double strokes per minute.	One man descends in	500 men in
Ordinary double..	10 ft.	5	8 m.	1 h. 47 m.
Swift "	10 "	10	4 m.	54 m.
Large Belgian....	10 "	5	8 in.	27 m.

The Belgian machine is here assumed to be carrying four men on each platform. On ladders one man usually descends 800 ft. in about 30 m., and ascends in an hour. The time allowed for 500 men is about 2½ hours to descend and 5 hours to ascend. The waste of strength involved is also to be considered. When miners are hoisted in the cages, the average velocity being about 15 ft. per second,

and the average load four men, about 3½ hours are required to lower or raise 500 men in a double vertical shaft of 800 ft.; or when the load is six men, 2½ hours. At the Comstock mines, Nevada, 12 men descend at once, at a rate varying from 400 to 800 ft. per minute. Some of these mines are more than 1,600 ft. deep.

IV. PROTECTION OF THE WORKS AND WORKMEN.

Arrangements for the protection of the miners and works include timber or other supports, ventilation, and drainage. Shafts and permanent ways are carefully protected, if necessary, with stout timbering, masonry, or even cast-iron linings. Pillars of rock left standing, piles of waste material packed in the empty spaces, and posts, stulls, lagging, &c., suffice for stopes. In some mines the temporary supports are iron columns, or even screw-jacks, which can be removed without damage and used again. Ventilation is necessary to remove explosive and inflammable gases (carburetted and sulphuretted hydrogen and carbonic oxide, which are also poisonous), and simply poisonous gases, such as sulphurous acid, carbonic acid, and quicksilver or arsenic vapors. Natural ventilation is secured by having two openings to the mine, at one of which (called the intake or downcast) fresh air enters, while the foul air escapes at the other (upcast). The difference in altitude between these openings, and the difference in temperature between the entering and the escaping air, determine the strength of the natural ventilation. It is likely in temperate climates that the air in the mine will be warmer in winter and cooler in summer than that outside. Hence the draft will be in winter out through the highest opening, and in summer the reverse, while periods of stagnation will occur in spring and autumn. The natural draft may be assisted by wise choice of the localities for the openings, or by use of weather caps and chimneys over the upcast; but these aids are not effective except where the intake is an adit. Artificial ventilation is effected by increasing the difference of temperature between the entering and the escaping air, so as to render the currents comparatively independent of the weather, or by increasing mechanically the difference in density. In the first class of instances, either the escaping air is warmed, or the entering air is cooled; in the second class, either the escaping air is rarefied by suction, or the entering air is condensed by blowing. The escaping current may be warmed by connecting the upcast with the chimney of a steam boiler above ground, or with a special furnace above ground, or by means of a furnace in the shaft, or near the bottom of it, or by introducing steam jets into the shaft. The jets have a mechanical as well as a thermal effect; but the total effect per pound of coal consumed is less than that of the furnace. The cooling of an entering current of air is sometimes effected by allowing water to fall into the downcast, and is also an incidental effect of the water

blast or hydraulic bellows, a simple contrivance by which a falling stream carries a draft of air with it into a receiver, where the air is disengaged from the water, and forced, under a pressure due to the water column, into the mine. Ventilating machines (exhausting or blowing machines) are used almost exclusively in coal mines, where a great excess of air, to dilute injurious gases, is a vital necessity. These ventilators are either reciprocal (pumps) or rotary (fans). The latter are generally employed, and for extensive ventilation the exhausting fans are usually preferred to the blowers. One of the most effective fans, Guibal's, gives, with a diameter of 14·34 ft. and 8 arms revolving 134 times per minute, a current of 929 cubic feet of air per second. The distribution of the air currents through the mine, so as to bring fresh air to the workmen, and remove all foul gases to the upcast, is very important, and requires a system of air courses, doors, &c. Portable lights in mining are torches, candles, and oil safety lamps. (See LAMP.) Stationary lights are also employed (lanterns with oil or petroleum, gas light, and various electric lights) for illuminating permanent roadways, landings, &c. The drainage of mines is effected by natural means (through adits) or by means of pumps or buckets. These are sometimes operated by hand or horse power or wind, more frequently by hydraulic engines, and most frequently by steam. V. MINING LAWS AND SCHOOLS. The inalienable right of the sovereign to the metals in the soil is an ancient doctrine, particularly with regard to the precious metals, but is gradually passing away in civilized countries, the governments of which are selling the "mineral rights" which they have hitherto farmed out or operated directly for the revenues of the state. A police supervision, in the interest of public safety and of political economy, is usually maintained. The laws of European states regulate minutely the privileges granted to miners, and their relations to the government and to the proprietors of the soil. In England and the United States, the title to the minerals beneath the surface usually goes with the ownership of the land, but may be disposed of by sale or lease separately. Gold and silver mines were excepted in Great Britain up to the time of William and Mary, being obliged to pay a royalty to the crown. On the public lands of the United States, citizens are allowed to mine without royalty, according to the local regulations established by state and territorial legislation and by the citizens in each district, subject to the general mining laws passed by congress, which fix as the conditions of the possessory title or license a suitably recorded claim, and the performance of a certain amount of work annually. A complete title, covering a surface tract, and the right to the mineral veins having their outcrops or apexes within the vertical planes bounding the said tract, together with the right

to follow such veins in depth, though they may extend under the surface of adjoining tracts, may be obtained after survey and advertisement, by purchase from the United States, at the rate of \$5 per acre of surface patented. The mining law is administered, like the agricultural land laws, by the commissioner of the general land office at Washington. In most civilized countries statistics are compiled annually by the government, showing the production of mines and metallurgical works. In the United States this is done imperfectly in the decennial census, and has been done since 1866 for the states and territories west of the Rocky mountains, with particular reference to the gold and silver product, by a special commissioner of the treasury department. (For statistics, see the articles on the different metals and countries.) Regulations to secure safety of miners, and to determine the rights of mining operators toward each other and toward land owners, are made by the individual states and territories.—In European countries schools have long existed for training engineers and metallurgists for this industry. Among the most celebrated are the mining academies of Freiberg in Saxony, Clausthal in the Hartz, Schemnitz in Hungary, Leoben in Styria, the academy at Berlin, the *école des mines* at Paris, and the royal school of mines in London. Much attention has of late been given to this subject in the United States, and the following institutions give special instruction in these branches: the school of mines of Columbia college, New York; the Rensselaer polytechnic institute, Troy, N. Y.; the Pardee scientific department of Lafayette college, Easton, Pa.; the Sheffield scientific school of Yale college, New Haven, Conn.; the Massachusetts institute of technology, Boston, Mass.; the school of mining and practical geology of Harvard university, Cambridge, Mass.; the Stevens institute of technology, Hoboken, N. J.; the school of mining and metallurgy of Lehigh university, Bethlehem, Pa.; the scientific department of the university of Pennsylvania, Philadelphia; the school of mines at Rolla, Mo.; the polytechnic department of Washington university, St. Louis, Mo.; the school of mines at Golden City, Colorado; and the university of California, Berkeley, Cal.

MINER, a S. E. county of Dakota, recently formed, and not included in the census of 1870; area, 432 sq. m. It is intersected in the W. part by the Dakota river. The surface consists of gently undulating prairies.

MINER, Alonzo Ames, an American clergyman, born in Lempster, N. H., Aug. 17, 1814. He was principal of the scientific and military academy of Unity, N. H., from 1835 to 1839, when he was ordained a minister of the Universalist church, was settled at Methuen, Mass., and in 1842 took charge of the second Universalist church in Lowell. In 1848 he was associate pastor, and in 1852 pastor of the second Universalist church in Boston. He was presi-

dent of Tufts college, Medford, Mass., from July, 1862, to November, 1874, when he resigned to return to his former charge in Boston. He has edited "The Star of Bethlehem," has contributed to periodicals, and has been prominent as an anti-slavery and temperance lecturer.

MINER, Thomas, an American physician, born in Middletown, Conn., Oct. 15, 1777, died in Worcester, Mass., April 23, 1841. He graduated at Yale college in 1796. The next six years he passed in teaching, and in the study of law, which in 1803 he abandoned for medicine, and in 1807 he commenced practice at Middletown. About 1809 a malignant epidemic fever, called spotted fever, prevailed in the Connecticut valley, for which he pursued a new mode of treatment, making careful notes of his cases. In 1823 he published, with Dr. William Tully, "Essays on Fevers and other Subjects," and in 1825 a treatise on "Typhus Syncopticus." His autobiography appeared in the "New Englander," vol. ii., p. 19.

MINERAL, a N. E. county of West Virginia, separated from Maryland by the North branch of the Potomac river, and intersected by Patterson creek and other streams; area, about 550 sq. m.; pop. in 1870, 6,332, of whom 378 were colored. It is crossed by several mountain ridges, between which lie picturesque and fertile valleys. The Baltimore and Ohio railroad runs along the N. and W. border. The chief productions in 1870 were 50,915 bushels of wheat, 13,257 of rye, 71,895 of Indian corn, 29,331 of oats, 8,891 of potatoes, 23,406 lbs. of wool, 52,078 of butter, and 5,104 tons of hay. There were 1,333 horses, 5,172 cattle, 6,429 sheep, and 2,563 swine. Capital, New Creek.

MINERAL DEPOSITS. The useful minerals occur in a variety of forms and conditions, and the deposits which are composed of or include them may be classified into superficial, stratified, and unstratified deposits. I. **SUPERFICIAL DEPOSITS.** In these, the materials are yet unconsolidated, and have been washed down from cliffs and mountain slopes composed of rocks that contain metals, ores, and gems, either in veins or irregularly disseminated. This category includes the gold of the surface deposits associated with the gold-bearing rocks of California, Colorado, Australia, the Ural mountains, &c.; the platinum of Oregon and Siberia; the "stream tin" of Cornwall, Banca, Australia, and Durango; the diamonds of Golconda, Brazil, and South Africa; and the rubies and sapphires of Ceylon. From such deposits all the platinum, all the diamonds, and probably nine tenths of all the gold in use have been procured. The working of these deposits constitutes the simplest form of mining, viz., washing with water. The minerals obtained from them are usually distributed very sparsely through the rocks in which they primarily occur; and as in the course of ages, by frost, sun, rain, and ice, these rocks have been comminuted and washed away, the metals and precious stones they contain have been

sorted and concentrated by the action of water, so that in many instances they are gathered with little labor. By the Spaniards, the superficial deposits containing gold are called *placers*, and the working of these deposits has come to be generally termed placer mining.

II. **STRATIFIED DEPOSITS.** The useful minerals sometimes form entire strata, such as beds of coal and iron ore; and they are sometimes disseminated through sedimentary rocks of which they form a larger or smaller part. In this latter category are included the clay-ironstone of the coal measures, which forms nodules thickly set in beds of shale, and the copper in the copper schists of Mansfeld, in the triassic sandstones of New Mexico, and in the sandstones and conglomerates of Lake Superior. III. **UNSTRATIFIED DEPOSITS.**—1. *Eruptive Masses.* Formerly most of the deposits of crystallized iron ore (magnetite and specular iron) were supposed to be eruptive. We have learned now that they are for the most part only stratified deposits very much disturbed and metamorphosed. Such is certainly the character of the iron ores of Missouri, Lake Superior, and the Alleghany belt, all of which may be shown to be simply changed and disturbed beds of iron ore, once deposited in nearly horizontal sheets. The famous deposits of iron ore of the island of Elba and of Nizhni Tagilsk in Russia are still believed to be eruptive, but it is probable that they will hereafter be shown to belong to the same category with our American crystalline iron ores. Iron is a common ingredient of volcanic rocks, and in some instances the quantity contained in them is so great that they may be termed low-grade iron ores; but such cases are extremely rare, and it is very doubtful whether there are any deposits of metals or ores of economic value which can properly be regarded as eruptive masses. It is scarcely necessary to say that the great deposits of metallic copper found on Lake Superior, and supposed at one time to be the result of subterranean fusion, are now clearly shown to be the products of chemical precipitation, and to have been deposited much as copper is precipitated in the electrotype process.—2. *Minerals disseminated through Eruptive Rocks.* Of this class of deposits, magnetic iron contained in volcanic rocks and the copper in the amygdaloids of Lake Superior may be taken as examples. In Japan the iron derived from decomposing volcanic rocks is collected and used, and large quantities of copper are obtained from the so-called melaphyres of the Portage Lake district on Lake Superior; but as a general rule igneous rocks are very barren in useful minerals.—3. *Contact Deposits.* The plane of junction between two rocks of different kinds, such as igneous and sedimentary rocks, is frequently the place where metals or ores have accumulated and form concretions, strings, or sheets. Examples of this may be seen in the deposits of copper at the junction of the trap and ash-

bed and of the trap and sandstone in the Lake Superior series.—4. *Impregnations*. In certain cases metalliferous minerals are found diffused irregularly through rocky masses, the deposits of ore having no definite boundaries or any regularity of structure, and appearing as though the rock had soaked up or absorbed the minerals, as water saturates a sponge. Such accumulations of ore are called impregnations. The deposits of mercury exhibit this character in a marked degree.—5. *Fahlbands*. This name has been given to a peculiar kind of deposit where the ore is sparingly diffused through certain layers, which are prone to disintegrate and are more *fahl* (i. e., foul or rotten) than the associated strata. Typical examples of this kind of deposit may be seen in the silver mines of Kongsberg, Norway, but they are not common elsewhere. Usually the fahlbands are only rich enough for working where cut by veins.—6. *Stockwork*. Where the masses of metalliferous rock are penetrated in every direction by threads or strings of ore, so that the whole must be taken out together, it is called a stockwork. Such deposits occur locally in many mines, but rarely to such a degree as to give character to the mining operations. The copper mines of Lake Superior, and the silver mines of Norway, Freiberg (Saxony), and Nevada, all furnish examples of stockwork.—7. *Mineral Veins*. These are usually sheets of mineral matter, of greater or less lateral and vertical extent. They have been divided into three principal varieties, which are generally well marked, but which sometimes blend in such a way as not to be easily separated. These varieties of mineral veins are known as gash veins, segregated veins, and fissure veins. *a. Gash Veins*. These are such as are confined to a single stratum or formation, and hence



FIG. 1.—Gash Veins filled with Lead Ore in Galena Limestone. *a*, Crevice opening. *b*, *c*, Crevices with pocket openings.

are of limited extent both laterally and vertically. The best examples of gash veins are seen in the lead mines of the upper Missis-

sippi. Here the ore is found in a single formation, the Galena limestone, a member of the Trenton group of the lower Silurian. It usually occurs in vertical fissures at no great depth, sometimes very narrow, sometimes

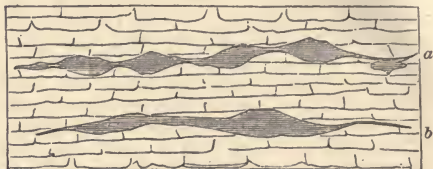


FIG. 2.—Horizontal Gash Veins or Floors of Lead in Galena Limestone. *a*, Crevice with pocket opening. *b*, Crevice openings.

opening into caves or chambers lined with "mineral." These gash veins have apparently been formed by the shrinkage of the Galena limestone after its deposition. Subsequently the shrinkage cracks were enlarged by the dissolving away of their walls, and were lined with galena, deposited from a solution which exuded from the adjacent rocks. Similar veins also containing galena occur in Missouri, but in a formation somewhat more ancient, the magnesian limestone, supposed to be the equivalent of the calciferous sand rock of New York. The fact that these gash veins are limited to a single formation has been amply proved by numerous shafts sunk in the hope of finding the ore at a greater depth, all of which have been failures. *b. Segregated Veins*.

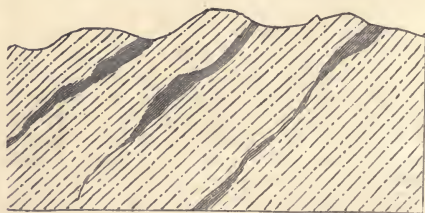


FIG. 3.—Segregated Veins of Auriferous Quartz in Gneiss.

These are usually lenticular sheets of ore-bearing mineral, which are conformable to the bedding of the associated rocks, that is, are interposed between the layers of such rocks. Segregated veins always occur in metamorphic rocks, and are usually inclined at a high angle with the horizon. They are called segregated veins because they are supposed to have been formed in the process of metamorphism by the separation or withdrawal of the materials which compose them from the adjacent strata, and their concentration along certain lines. Segregated veins are limited both laterally and vertically. They rarely exhibit anything of the banded structure which characterizes fissure veins, are chiefly composed of quartz, and form the great repositories of gold. All the quartz veins, which are so common in the

granitoid rocks of the Alleghanies, belong to this class and carry more or less gold. Iron pyrites is an almost constant associate of gold in segregated veins, sometimes being present in great quantities. Copper is also frequently contained in them, and in less quantity nickel. Though segregated veins have generally no great lateral or vertical extent, they sometimes attain a thickness of 20 or 30 ft., and have a length on the surface of a mile or more. The Pine Tree and Josephine lodes on the Mariposa estate in California have a thickness of 4 to 12 ft., and are said to be traceable for some miles. These are reported to be segregated veins lying in sheets of slate rock of Jurassic age. Segregated veins are generally of much more modest dimensions, and are seen to lie alternately or *en échelon* along the outcrops of the containing rocks. In Australia the gold-bearing segregated veins are commonly termed "quartz reefs," having doubtless derived their name from the fact that, being harder than the associated rocks and yielding less readily to atmospheric erosion, they are left in relief, sometimes projecting in ridges above the surface.

c. Fissure Veins. These are of indefinite extent, laterally and vertically. They have been formed by volcanic or earthquake action, by which the rocks have been fractured and displaced. In all cases where an important crack or fissure is made by subterranean upheaval, either by the slipping in of wedges of rock or by the shifting of the sides of the fissure so that their irregularities fail to match, the walls are prevented from returning to their original positions, and an irregular open crevice is produced. When subsequently filled by foreign matter containing metals or ores, such a fissure becomes a fissure vein. In some instances the fracture of the rocks has considerable regularity, and the fissure may be of uniform width for several hundred feet in either direction. More generally, and especially where a fracture

come in contact, the vein becomes very thin and may be quite pinched out. From their mode of formation fissure veins are without definite limits horizontally or vertically. They may frequently be traced for miles upon the surface, and their limits in depth are rarely reached. Hence they hold more extensive and continuous deposits of ore than any other kind of mineral veins, and constitute the most trustworthy bases for mining operations. Fissure veins frequently exhibit a banded structure in the materials which compose them, and this forms one of their most striking characteristics. This feature is produced by the deposition on their walls of successive layers of different minerals, such as quartz, fluor spar, calc spar, copper or iron pyrites, blende, galena, and baryta. These layers often correspond on either side of the central line, showing that the deposition of the different sheets took place simultaneously on both walls. Sometimes a fissure vein exhibits a double or triple

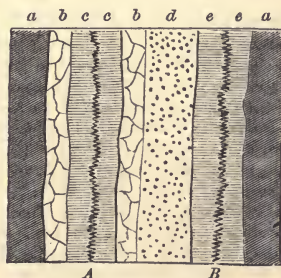


FIG. 5.—Double Fissure Vein. *a a*. Country rock. *b b*. Calc spar. *c c c*. Comby quartz. *d*. Heavy spar. *A B*. First and second fissures.

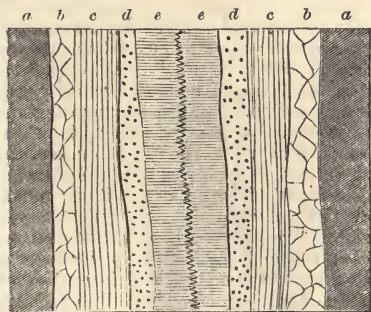


FIG. 4.—Section of a Fissure Vein, showing banded structure. *a a*. Country rock. *b b*. Calc spar. *c c*. Galena. *d d*. Heavy spar—sulphate of baryta. *e e*. Comby quartz.

is attended with displacement, the fissure is of very unequal width; the vein matter has in places a thickness of many feet, while at other points, where the projecting walls approach or

series of bands, showing that after being filled with ores it was again opened and a new fissure formed, and then this was filled in the same way as the first. The quartz which constitutes a large part of the material composing fissure veins frequently shows a "comby" structure, due to the formation of crystals which shoot out from the walls and interlock where they meet. Another common feature in fissure veins is the "flucan" or "selvege," a sheet of clay which lines either wall and causes the vein matter to cleave off readily. This flucan seems to be due partly to the attrition of the sides when moved with immense force upon each other, and partly to the action on the walls of chemical solutions filling the fissure. The sides and sometimes the interior of fissure veins generally show polished and vertically striated surfaces ("slickensides"). These are undoubtedly produced by the friction of the walls on each other or on the material composing the vein. As will be inferred from what has been said of their mode of formation, fissure veins cut indiscriminately through all kinds of rock. They frequently traverse stratified rocks across their lines of

deposition and outcrop, and are then called "cross-cut" veins, to distinguish them from those that are more or less accordant with the stratification. The materials composing fissure



FIG. 6.—Fissure Vein with Cavity or "Vug" at Centre. *a a*. Country rock. *b b*. Heavy spar. *c c*. Calc spar. *d d*. Blende. *e e*. Comby quartz. *f*. Vug.

veins are very varied; indeed, it may be said that nearly all the minerals known are found in them. Quartz is a conspicuous ingredient in fissure veins, but sulphate of baryta, calc spar, and fluor spar sometimes form almost the entire mass of the veinstone.—The ores which are contained in fissure veins, like the earthy minerals, are widely varied. Silver, copper, lead, tin, zinc, antimony, iron, and more rarely many other metals are found in them. Gold is less common in fissure than in segregated veins, and it is almost never the sole object of search in their exploitation; but it is a recognized constituent in the veins worked in Cornwall, and in the silver ores obtained from some of the mines in Idaho, Nevada, Mexico, and South America. Silver may be regarded as the most valuable constituent of fissure veins, and all the great silver mines of the world are worked in veins of this character. The Comstock lode, near Virginia City in Nevada, is a true fissure vein, and perhaps the largest and richest known. It has been traced on the surface for several miles, and has been worked to the depth of 1,600 ft. Its normal width is perhaps 200 ft., but in places it expands to 800 ft., though here divided into several veins by great wedges or "horses," split off from the walls. It cuts through syenite and propylite, and evidently marks the line of a great fissure opened by volcanic action. All the silver mines of Nevada belong to the same class with the Comstock, though the other veins are generally of much more moderate dimensions. They are worked in fissure veins which traverse all the varieties of rock found in that region, such as granite, porphyry, trachyte, slate, and limestone. The number of these veins, the disturbed and broken condition of the strata, and the abundance of volcanic rocks in the district, all prove that it has been long the theatre of intense volcanic and earthquake action. In Nevada and Utah

some very rich mines have been worked in deposits of ore, of which the true character has been imperfectly understood and very much misjudged. These are the chambers or pockets of ore so characteristic of the White Pine district, Nevada, and that of Little Cottonwood cañon in Utah, the latter including the famous Emma mine. These districts have been the centre of intense mining excitement and scenes of the wildest speculation; of the most unparalleled successes and sudden and complete failures. A large part of this history has been consequent on the peculiar nature of these mineral deposits. In both these districts the ore occurs in limestone, and often in chambers frequently of considerable size. These when first opened were supposed to hold incalculable wealth, but they proved to be of limited extent and were soon worked out. The relations of the ore chambers of White Pine and Little Cottonwood to the silver-bearing fissure veins of Nevada and Utah are not at first sight apparent, and yet they are unquestionably products of the same general cause. The true theory of their deposit is probably this. The "country rock," *i. e.*, the rock enclosing the deposits of ore, unlike that of most of the mining districts of the west, is limestone. Many limestones are soluble in atmospheric water which holds carbonic acid in solution. In some limestone countries the underlying rock is honeycombed by caves and subterranean galleries, forming a system of underground drainage. The table land of Kentucky affords a typical example of such a region, and the Mammoth cave is only one of an immense system of natural sewers, by which the drainage of the surface is effected. If now the Kentucky table land were much disturbed by an earthquake and fissures were opened through the limestone, and these fissures were filled to form mineral veins, then, wherever these fissures communicated with the subterranean chambers and galleries, these would also be filled with vein matter and ore, and a condition of things would be produced similar to what we now find in Utah and Nevada, though on a much grander scale. With this explanation the western pockets and chambers of silver ore are seen to be natural offshoots and appendages of the fissure veins so common in the region where they occur.—*The Filling of Mineral Veins.* The manner in which the materials composing mineral veins have been deposited has been a matter of much discussion among geologists, and one about which there has been and still is considerable diversity of opinion. The theories which have been advanced to account for the phenomena are briefly as follows. *a. The Theory of Injection.* This was proposed by the Plutonists, who were prone to ascribe all the great changes on the earth's surface to the action of heat. There are few mineral veins, however, composed of materials which can be regarded as even the possible product of fusion, and most

of them contain minerals which could never have been formed in the presence of great heat. The veins containing great masses of copper on the south shore of Lake Superior, when first described, were considered as shining examples of the truth of the igneous theory; but the frequent occurrence of masses of native silver in the copper, both metals being distinct and almost chemically pure, prove that these metallic masses could never have been fused together, as in that case they would have formed an alloy. Other evidence has been cited by Prof. Pumpelly which demonstrates that none of the copper veins have been filled by igneous action, but that the materials they contain have been deposited from solution. Trap dikes, which are fissures filled by injected volcanic material, have doubtless suggested the igneous theory of mineral veins; but when they are carefully examined the materials which compose them are found to be quite different in their nature and arrangement from those which form mineral veins. In fact, dikes and veins have only this in common, that they fill similar fissures produced by subterranean violence. *b. The Theory of Aqueous Deposition.* This theory apparently emanated from the Wernerian school, who regarded water as the great, if not the sole cause of geological phenomena. The advocates of this theory have suggested that fissures have been opened up into seas or other water basins, and that the vein material has been deposited from water, as limestone and other sedimentary rocks are laid down. A fatal objection to this theory is that we never find the materials composing true fissure veins horizontally stratified as aqueous sediments are, but on the contrary these materials are often deposited vertically against the walls of the fissures. Again, if the vein materials were deposited from reservoirs into which they opened, the bottoms of these reservoirs ought to show similar sheets of matter, whereas nothing of the kind has ever been found. *c. Lateral Secretion.* According to this theory, the materials of mineral veins have been derived from the adjacent rocks by percolation through the vein walls. If this were true, we should find the contents of veins changing with every stratum through which they pass, whereas in fact the composition of a mineral vein is often nearly identical in all parts of its course, notwithstanding it may pass through a variety of strata. Again, where two systems of veins cut through the same stratum, according to this theory, in that stratum their contents should be similar, whereas we often find them totally diverse. Where two veins cross each other, they are often seen to be of different ages, and to be composed of materials so different that they must have been derived from different sources. The banded structure of fissure veins seems also quite incompatible with this theory, for it is scarcely possible to conceive of the formation of the different layers which compose these

veins on the supposition that they have been deposited by exudation from the walls of the fissure, and that the totally distinct minerals composing the inner and newer layers have been transmitted through those first formed. As has been mentioned, in gash veins the cavities are filled or lined with materials derived from the adjacent rocks, but these cases afford us no satisfactory explanation of the filling of fissure veins, the only ones about which there is any question. *d. Sublimation.* Most of the minerals, and perhaps all of the metals, can be sublimed at a very high temperature; and some of them, as zinc, arsenic, and mercury, are vaporized at a comparatively low temperature. The fissures about a volcanic crater are frequently lined, sometimes filled, with minerals, some of them ores, which have plainly been driven out from the volcano in a state of vapor. Such cases have led some theorists to suppose that sublimation played an important part in the filling of mineral veins. As has been said, the deposits of mercury have often the character of impregnations, and in some instances at least we have good evidence that mercury is diffused in the form of vapor; but these deposits have certainly very little in common with the distinctly limited, often banded and crystallized matter filling mineral veins, properly so called. Hence this theory is in the main rejected by modern mineralogists. *e. Chemical Precipitation.* This theory attributes the deposition of mineral matter in veins mainly to precipitation from solution, and this is the view now generally taken by those best informed on the subject. According to this theory, fissures destined to become fissure veins are first filled with water, usually flowing from sources deep in the earth, where, highly heated and under great pressure, it becomes charged with mineral substances. As it approaches the surface and the temperature and pressure are reduced, its powers of solution are diminished, and a large part of the materials it has carried are precipitated on the sides of the channel through which it flows. The abundant and varied deposits made by thermal springs illustrate the sufficiency of this cause. In this view, the banded structure which is exhibited by mineral veins is attributed to changes during the lapse of ages in the nature of the solution, dependent upon some deep-seated cause, such as successive convulsions opening new sources for the supply of material. Sulphur we know is one of the most common constituents of volcanic emanations, and the normal condition of most ores found in veins is that of the sulphide; and we have reason to believe that they are mainly deposited from a hot solution in which sulphur was the most conspicuous ingredient. Highly heated water or steam, containing sulphur, fluorine, and chlorine, would be capable of dissolving most of the minerals with which it came in contact. It would certainly be charged with silica, and if flowing or driven through

rocks containing even minute quantities of silver, gold, lead, iron, copper, or other metal, would gather these materials, and coming toward the surface would precipitate them in the form of sulphides. The replacement of animal and vegetable tissues by mineral matter, which often occurs in their fossilization, affords proof that chemical solution is entirely adequate to produce all the phenomena exhibited in the filling of mineral veins. In petrified wood the vegetable tissue is replaced, particle by particle, by silica, evidently deposited from solution. The sulphides of copper and iron often replace wood in the same way, and this could only take place on a great scale, as it often does, when the rocks were saturated with a solution containing these metals. The formation of geodes, the filling of the cavities of amygdaloids with agate, chalcedony, and zeolites, the sheets and stalactites of iron and lead in the Galena mines, and the stalactites of lime in caves, prove that such solutions are constantly flowing through the rocks beneath us. In some formations and localities molluscan fossils are found completely replaced by galena, pyrites, and blende, the lime of their shells having been carried away and the different ores deposited in its place. In the cavities left by some shells, successive layers of sulphides of lead, iron, and zinc are deposited, showing in miniature almost precisely the phenomena observed in mineral veins.—A few general features in mineral veins remain to be noticed. Oftener than otherwise, the mineral veins of any district are seen to belong to one or more systems in which the individual veins have nearly a common bearing and a general similarity of composition. In the mining district of Cornwall, England, there are two principal systems of veins, one running nearly north and south, the other approximately east and west. The latter carry copper and tin, the former chiefly lead and iron. In the lead region of the upper Mississippi there are also two principal systems of veins, which vary somewhat in their bearing, but are generally known as the north and south and east and west courses. In the mining district of Freiberg, Saxony, nine systems of veins are said to have been identified; and in the silver belt extending parallel with the Pacific coast, from Idaho and Nevada to Chili, which has been almost constantly shaken and shattered by earthquakes, the systems of veins are almost innumerable. In less disturbed regions, like the Mississippi lead district, the courses of the veins coincide with the jointing of the rocks, and thus in many instances exhibit a kind of polarity; that is, one set of joints coincides with or approaches in direction the meridian, while the other is nearly at right angles to this. There is little doubt that the system in the jointing of rocks, and hence in the bearings of mineral veins, often determined by the jointing, has been considerably affected by terrestrial magnetism. It is also probable that this

cause has operated to control or influence the deposition of mineral matter in veins. Mr. Fox of England found that the water in the copper mines was a weak solution of salts of copper, and that the galleries filled with this solution were in fact cells of galvanic batteries, from which well marked currents were produced. Solutions similar to these found in old copper mines, but hotter and stronger, have undoubtedly filled most of the fissures now occupied by metalliferous veins. It is easy to see that such cells might generate powerful magneto-electric currents, by which the metals, especially silver and copper, might be precipitated in great quantity, just as they are now precipitated in the electro-plating process.

—*Gossans*. Nearly all mineral veins are found to be very much weathered and decomposed along their line of outcrop. The decomposition generally extends down to the permanent water level, below which the ore is in its normal state, and this for the most part is sulphide. When exposed to the action of atmospheric water and air, the sulphides are oxidized, and the whole mass of the veinstone is frequently rendered soft and spongy, and highly colored in various ways. When the vein contains much iron pyrites, this is converted into the hydrated sesquioxide of iron, coloring all the decomposed mass brownish red. From this fact the changed portion of the vein is called in Germany the *Eisenhut*, iron hat. In Cornwall the decomposed portion of a mineral vein is called a *gossan*; and this term has been universally adopted in all mining districts where English is spoken. In the gossans of veins we usually find the sulphides of silver converted into chloride, bromide, iodide, &c., with many sprigs and masses of native silver. Copper ore, generally the sulphide of copper and iron in its normal state, is converted first into red or black oxide, and then into malachite, azurite, and chrysocolla, the carbonates and silicate of copper. Locally, when effected by saline solutions, as in South America, atacamite, the chloride, is produced. All these secondary forms of ores are more easily treated than the sulphide, and the gossan which contains them is usually loose and easily excavated. This portion of a mineral vein is therefore much more easily and cheaply worked than that which lies below the permanent water level. Hence the first workings of mineral veins are frequently highly remunerative, while the cost of deeper excavations in harder rock, and the expense of treating the more intractable sulphides, cause subsequent operations below the water level to result in disappointment. In many mining districts, like those of the southern Alleghanies in the United States and of Sonora in Mexico, the first comers, by working the gossans, were able practically to skim the cream of the mineral veins, carrying off great profits, and leaving to the second generation an inheritance of which the value is often worse than doubtful.

MINERALOGY, the science which treats of the composition, structure, formation, and classification of minerals. The term therefore covers both descriptive mineralogy and mineralogy, which is the study of the laws in accordance with which minerals are formed. All objects in nature consist of certain substances recognized as elementary bodies, which exist either as individual wholes, when they are called native elements, or combined with one another. All the native elements belong to the mineral kingdom, and also all combinations of elements which do not pass through the cycle of change called growth. The combinations of the elements which man produces all belong to the mineral kingdom, since he is not able to impart the principle of growth. When his products are homogeneous in composition and structure, they are, strictly speaking, artificial minerals; and chemists are able to reproduce a great number of the combinations found in nature. The study of minerals presents three general classes of characteristics: chemical composition, crystalline form, and physical properties. I. **CHEMISTRY OF MINERALS.** In combining, the elements exhibit a strict subjection to certain fixed modes of union, and these modes are the laws of chemical combination, which are still very imperfectly understood. Chemists recognize two kinds of units. The smallest possible particle of an elementary substance is called an atom. These atoms seem to exist in a state of polarity, and to possess electrical attraction and repulsion, by means of which they effect union with each other and with the atoms of other elements. They are not always able to exist by themselves, but the atoms of some elements act in pairs or triplets, or in some other degree of union. This combination of atoms, whether composed of the atoms of more than one element, or of one only, is called a molecule. Molecules have the power of cohesion, and by their aggregation masses of matter are formed. Both of these units are used in mineralogy. Every true mineral is formed of innumerable molecules cohering together, and each of these molecules is composed of one or more atoms of each element contained in the mineral, according to the proportion in which it is present. While there is unending diversity in the composition of minerals, it is found that the elements always unite in some simple proportion or ratio. Three kinds of ratios are used in mineralogy. The percentage ratio is the one in which analyses are always published. It assumes the weight of each molecule to be 100, and expresses the proportionate quantity of each element in the molecule in parts of 100. Lime, for instance, contains 71.43 per cent. of calcium and 28.57 per cent. of oxygen. The atomic ratio is the ratio between the number of atoms of each element in the molecule, and is obtained by simply dividing the percentage ratio of each element by its atomic weight. When the symbol of a mineral is given, the atomic

ratio may be ascertained by simple inspection of the symbol. In lime, the symbol of which is CaO , the molecule is composed of 1 calcium and 1 oxygen, and the atomic ratio is therefore 1 : 1. In andalusite, which is composed of $\text{Al}_2\text{O}_3\text{Si}$, the atomic ratio of the aluminum, oxygen, and silicon is 2 : 5 : 1; while if the oxygen is divided between the aluminum and silicon, the compound will be considered as formed of two radicals, alumina and silica, and the atomic ratio of these will be 1 : 1, there being one of each. The third method of comparison is the oxygen ratio; it consists in a comparison of the number of oxygen atoms contained in the different oxygen compounds present. In andalusite, for instance, the alumina has three oxygen atoms and the silica two. The O ratio is therefore 3 : 2. The explanations so far given relate to the old method of writing chemical symbols. The new chemistry reaches the same results by a different mode of reasoning. Every binary compound consists of one positive and one negative element. Every ternary compound consists of one positive element, a second which is negative to the first but positive to the third, and finally a third which is negative to both the others. The number of negative atoms in a binary compound is found to vary with the different elements, each element having the power to fix a certain number of atoms of a more negative element; this power is called its atomicity or quantivalence. All of the stable binary compounds of hydrogen are found to contain one atom of hydrogen and one of the other element, whatever it is; and hydrogen is therefore taken as the standard. By comparing the other elements with it, it is found that 23 of them have a combining power equal either to 1, 3, or 5 hydrogen atoms; and these are therefore called univalent, trivalent, or quivalent. These never form stable saturated compounds with any even number of negative univalent atoms, and they are therefore called perissads, from the Greek word for odd numbers. The remaining 40 elements have a combining power which is 2, 4, or 6 times that of hydrogen, and they are therefore bivalent, quadrivalent, and sextivalent. These form the general class of *artiads*, and are never saturated when combined with an odd number of negative univalent atoms. The highest possible combining power of an element is called its atomicity, but this is not always the most common form of its occurrence, which is often one of the lower degrees; this prevalent form is its quantivalence. The oxygen ratio, although it was used with the best results in mineralogy long before the new chemical theories were established, is nothing more than the expression of the relative quantivalences of the different elements contained in a mineral. Oxygen is in all cases a negative element, and the number of its atoms which are combined with one atom of any other element, taken in connection with

the doubled atomic weights of the new chemistry, indicates the relative quantivalences of the combined elements. The change of ideas in regard to the modes of combination has necessarily produced a new mode of writing the symbols of minerals. Under the dualistic theory, when every ternary oxygen compound was supposed to consist of one oxide acting the part of a base and another oxide acting the part of an acid, the formula was constructed by writing the two compounds one after the other, as RO, SiO_2 , or $\text{R}_2\text{O}_3, 3\text{SiO}_2$, in which R stands for any basic element. The new system endeavors to make its formulas rational, that is, to construct them in such a way as to embody the present views in regard to chemical combination. The elements are divided into three classes: 1, the basic, which are positive to those following; 2, the acidic, which are negative to the foregoing, but positive to the third class; 3, the acidific, which are negative to both the first and second. In a ternary compound which consists of one element from each of these classes, the acidific element is supposed to act as a bond between the other two, and for that reason it is placed in the middle, the basic being written first, the acidific next, and the acidic last; as $\text{Mg}_2 \parallel \text{O}_4 \parallel \text{Si}$. It has been explained that one atom of each element has the power of uniting to itself a certain number of atoms (from one to six) of hydrogen or other univalent element; and just as the ancients provided the elements with hooks by which they caught hold of each other, so modern chemists express the quantivalence of an element by saying that it has a certain number of bonds of attraction. Magnesium has a quantivalence of 2, and as there are two molecules of it in the above symbol, the total number of its bonds in the formula just given is four. Silicon has a quantivalence of 4, so that the oxygen has four bonds to satisfy on each side, or eight in all. As its quantivalence is 2, the four molecules present in the compound have a total uniting power of eight. But the whole of the oxygen does not always play the part of a uniting element only. The number of molecules of uniting oxygen (or other acidific element) is equal to the number of bonds of attraction in the basic or acidic element, according as the former or the latter has the smaller number. In the symbol given above, the number of oxygen bonds is just sufficient to satisfy those of the other elements, but in the symbol MgO_2Si there are two bonds on one side of the oxygen and four on the other. In this case part of the oxygen is considered to be combined with that element which has the greater number of bonds to be satisfied. When this is the acidic element, as in the present case, the symbol is written with the acidic element at the left side; as $\text{SiO} \parallel \text{O}_2 \parallel \text{Mg}$. If the basic element had possessed the greater quantivalence, that element would have been written at the left; as in the symbol for chondrodite, $\text{Mg}_2\text{O}_2 \parallel$

$(\text{O}, \text{F})_{12} \parallel \text{Si}$. Thus the symbols are made to express the mineralogist's views of the constitution of minerals.—*Replacement.* Minerals in their chemical composition are elementary; binary, ternary, quaternary, &c., according as the number of molecules of which they are composed is one, two, three, or four, &c. This, however, does not indicate the possible number of elements present, since each molecule may contain several elements. Enstatite, which is composed of magnesium, oxygen, and silicon, is a ternary; and diacrasite, which has magnesium, iron, calcium, oxygen, and silicon in its composition, is also only a ternary, since the first three elements form only one basic molecule. In this case each element in the basic molecule is a dyad (that is, it has a quantivalence of 2), and it may not seem strange that, with equal powers of combination, they should be able to replace each other. But other minerals are found which contain elements of the most diverse degrees of quantivalence, and therefore in the most diverse states of combination. Zircon sometimes contains a protoxide, a sesquioxide, and a deutoxide. The law under which these diverse combinations are brought harmoniously together is that "the replacing power of the elements is in proportion to their combining power." Thus one molecule of an element which has four bonds of attraction, like tin, is able to replace two molecules of an element which has only two bonds of attraction, like calcium. In stannite, which is a sulphide of copper, tin, and iron, the proportions of these elements are 2:1:1. Copper, which is bivalent, requires two atoms to occupy toward sulphur the same relation which one atom of tin and iron has. The proportion in which any element in any state of combination must replace other elements in a different state may be ascertained from the following table, in which the line A contains the several oxides that are known, the line B contains the same oxides reduced to a common oxygen standard ($\text{O}=1$), and the line C represents the proportions in which the bases are interchangeable. The different states are represented by Greek letters in order to avoid confusing fractions. Thus the beta state is sesquioxide and the gamma state is the deutoxide. R is used to represent any basic element, and it is to be remembered that, though only oxides are represented here, the rule holds good for all negative elements.

A. RO , R^2O^2 , RO^2 , R^2O^2 , RO^2 , R^2O^2 , RO^4
 B. RO , R^2O , R^2O , R^2O , R^2O , R^2O , R^2O
 C. αR , βR , γR , δR , ϵR , ζR , ηR

Any element in the tritoxide state (ϵR) therefore requires but one basic atom to replace three basic atoms of an element in the protoxide or alpha state. The method of writing the symbol of a mineral which has suffered such substitution may be seen from the symbols of magnetite and franklinite. The former contains iron in the alpha and in the beta state

of combination with oxygen. Its symbol is $(\frac{1}{2}\alpha\text{Fe} + \frac{1}{2}\beta\text{Fe})_4\text{O}_4$, and it is therefore a binary compound. In franklinite the αFe is partially replaced by zinc and manganese in the alpha state, and the βFe is partially replaced by manganese in the beta state. The symbol then becomes $[\frac{1}{2}(\text{Zn}, \text{Fe}, \text{Mn}) + \frac{1}{2}\beta\text{Fe}, \beta\text{Mn}]_4\text{O}_4$. The α is not written, the protoxide state being understood when no other is mentioned. The effect of the law of replacement is, that whatever kinds of binaries may be united in the mineral, the oxygen ratio is unchanged, and the use of this ratio is therefore continued in mineralogies, though the oxygen is no longer considered to be divided between the basic and acidic elements. It expresses the quantivalence of these elements, and this is held to be one of the most essential characteristics of a mineral species. While the power of replacement has

greatly increased the number of mineral species by presenting us with compounds which vary too much to be described under one name, it has lessened the number of groups in an equally marked degree, since the substitution often takes place without materially altering the other characters. Thus tourmaline, which is a ternary, sometimes contains 12 elements, and the basic molecule always contains elements in the alpha, beta, and gamma states. Their proportions vary so much that five classes have been made in which the O ratio of these three kinds of bases varies between 4:12:4 and 4:56:12; and yet tourmaline is usually very plainly recognizable and possesses very persistent crystallographic habits.—*Classification of the Elements.* With the foregoing explanations the following table in which the elements are classified will be understood:

CLASSIFICATION OF THE ELEMENTS.

SERIES I. A. <i>Perissads</i> .	SERIES II. A. <i>Perissads</i> .	SERIES III. A. <i>Perissads</i> .
Potassium, sodium, caesium, rubidium, lithium, thallium, hydrogen, silver, gold.	Nitrogen, phosphorus, arsenic, antimony, bismuth, columbium, tantalum in the δR state, boron (?).	Chlorine. Bromine. Iodine.
B. <i>Artiads</i> .	B. <i>Artiads</i> .	B. <i>Perissad</i>
1. Iron-aluminum group.	1. Sulphur group.	(or <i>Artiad</i>).
a. Iron sub-group: platinum, palladium, iridium, rhodium, osmium, ruthenium, copper, lead, mercury, iron, zinc, indium, cadmium, cobalt, nickel, manganese, chromium, uranium, tungsten, cerium, erbium, yttrium, glucinum, lanthanum, didymium, magnesium, calcium, strontium, barium; also H_2 , K_2 , Na_2 , &c.	Sulphur, selenium, tellurium, molybdenum; also ϵFe , ϵCr , ϵMn , ϵV , ϵW .	Fluorine.
b. Aluminum sub-group: aluminum (βAl); also βFe , βMn , βCr , βB , &c.	2. Carbon-silicon group.	C. <i>Artiad</i> . Oxygen.
2. Tin group.	2. Carbon-silicon group.	
Tin, titanium, zirconium, thorium; also γH_2 , γFe , γMn , γCo , γPb , γCu , &c.	Carbon, silicon; also γS , γSe , γTe , &c.	

The three kinds, basic, acidic, and acidific, are arranged in three series. Each series begins with a section of perissads, or elements with a quantivalence which is 1, 3, or 5, and ends with a section of artiads, or elements which have a quantivalence of 2, 4, or 6, thus bringing together allied elements. The basic artiads comprise two groups, one of protoxides and sesquioxides, and the other of deutoxides. The acidic artiads form a tritoxide and a deutoxide group. It is therefore plain that each group is made up of elements which occur in the same state of combination, or have the same quantivalence, and the groups might with perfect propriety be called the alpha, beta, &c., groups. Each group therefore includes not only its own leading elements, but also the α , β , or γ , &c., states of other elements; and therefore each group comprises a series of homœomorphous (or mutually replaceable) elements.

II. CRYSTALLINE FORM. Atoms are supposed to have definite shapes, for the greater number of the mineral species have exact geometrical forms which have been classified in six systems. (See CRYSTALLOGRAPHY.) The atomic form seems to be different for the different elements; and since the same element is sometimes found crystallized in more than one system, it is supposed that the number of atoms

in the molecule influences its shape. Thus the mineral species palladium is the native element of the same name, and crystallizes in the isometric system; while allopalladium, which is also the native element in a pure state, is hexagonal. The theory is that, while the molecule of palladium contains one atom, the molecule of allopalladium contains three atoms of the same substance. The diamond (isometric) and graphite (hexagonal) are both carbon, and form another example of this phenomenon, which is called isomerism. A great many of the compounds are identical in composition, but differ in form. Andalusite, fibrolite, and cyanite have the same composition, but crystallize in different systems, and have a different hardness and specific gravity; and these differences are ascribed to a more or less condensed molecule, but what the numerical relation of the atoms in these molecules is, has not been established. It has, however, been suggested that the forms assumed may be due to the number of negative atoms in the molecule. Thus protoxides may assume isometric forms, deutoxides may be tetragonal, and tritoxides hexagonal. While this theory is not entirely borne out by the facts, it would probably be more eminently plausible if other portions of our system were more perfect. Thus, though

protoxides, like water and zinc oxide, take the hexagonal instead of the isometric form, this fact leads mineralogists to look upon these minerals as being composed of condensed molecules containing three atoms of each element, and to write their symbols, H_2O_3 and Zn_3O_3 , rather than reject the theory. This theory does not account for all the examples of polymorphism, nor can they be accounted for without greater knowledge of the crystalline systems. Certain forms in some of the systems, when placed in a particular position, are identical, both in position and angle of the faces, with others in entirely different systems. Nevertheless, none of the efforts to reduce the crystallographic systems below six have been successful. It is, however, established that minerals may be isomorphous with others crystallizing in a different system, when their angles are nearly similar. The variations in the six systems depend upon the relative length of their axes; and when the axial dimensions of two minerals in different systems are nearly the same, they may enter into chemical or physical combination without violence to their individual laws of formation. The likelihood of such replacement is increased by the fact that the crystallographic forms of minerals, though precise in general, are not perfectly uniform in angle. Even the most important and distinctive angular measurements vary decidedly, and since a certain flexibility thus exists, the entrance of a different though similar mineral may take place without altering the angles beyond their ordinary limits. The extreme variation of axial dimensions which may take place is shown by the common and very well marked mineral calcite, the forms of which include 48 different rhombohedrons and 88 scalenohedrons, besides pyramids and prisms. If the extreme positive rhombohedrons were represented graphically on the same scale, one would be 112 times as long as the other. Yet these extremes are so intimately connected by gradually progressive steps as to forbid any classification of them.—Many theories have been proposed to account for the exact forms assumed by minerals, but two of them will be sufficient to indicate the tendency of speculation. One is chemical. It supposes that the elementary atoms and molecules have definite forms, and that when two elements combine, their molecules take a form which is dependent on the forces that produce the combination. The introduction of a third element may produce a complete rearrangement of the molecules and an entirely new form. The other theory is based on physical laws. It has been suggested that minerals crystallizing in the isometric system may be composed of spherical molecules, that being the form which any body free to move must take when acted on equally in all directions. Minerals crystallizing in the other systems are made up of ellipsoidal molecules, and the form is tetragonal or rhombic, according as the lateral

axes are conjugate axes or conjugate diameters of an ellipsoid. These axes and diameters are equal in all the systems except the triclinic, where they are unequal, and the vertical axis is at right angles to the other two in all but the monoclinic and triclinic systems. The hexagonal form may be produced by an ellipsoidal molecule in which three conjugate diameters form the axes on which the faces are laid. These axes are called crystallogenic, to distinguish them from the ordinary crystallographic axes, which are entirely distinct. Molecules are supposed to be governed by the laws of polarity, the opposite ends of the conjugate axes or diameters representing the north and south poles. By grouping them according to the known electrical laws, many of the remarkable compound forms can be imitated, and an interesting insight gained into the probable constitution of minerals. Local circumstances will sometimes alter the intensity of attraction between the molecules in favor of some one of the crystallogenic axes, and a distorted form will result. A more general modification of molecular relations produces secondary planes. What these local circumstances are is not known, but the character of the mother liquor, or of the solid matrix in which the mineral is formed, is certainly one of them. Laboratory experiments prove this, and in nature we find aragonite assuming different modifications according as it is found in iron mines or in gypsum clays; minerals collected from one locality often present a general likeness, and may differ from the same species found in another region.—Since a crystal increases by successive additions to a minute molecular nucleus, any variations in the intensity of the uniting force must produce alternate zones of strong and weak attraction. These pulsations of the formative force are the cause of cleavage, which is due to the lessened tenacity of the mineral along those lines which represent the period of weak action during the pulsation. III. PHYSICAL CHARACTERISTICS. Fracture, taste, odor, polarization, electrical properties, and transparency are among the least decisive peculiarities of minerals. Streak is a very important character in all classes. Lustre is of great importance in distinguishing the two kinds, metallic and non-metallic minerals. The value of the other physical characters depends upon the kind of mineral under examination. Among those possessing metallic lustre, the hardness, specific gravity, color, and state of aggregation are far more serviceable than with those of non-metallic lustre. The origin of physical properties is unknown, but it is certain that some of them, as transparency, polarization, and refraction, depend upon the relations of the molecules toward light; lustre, color, and streak may have a similar origin, varied by the operation of the forces which formed the mineral. To these forces, tenacity, ductility, and state of aggregation may also probably be ascribed. Some of the above mentioned charac-

ters, and also hardness and specific gravity, may be due partly or entirely to the state of chemical combination. It has been shown that the superior hardness and specific gravity of the epidote group of minerals, as compared with the scapolite group, may be explained by supposing that the molecule of the former is more condensed than that of the latter.—

Classification of Minerals. The explanations above given embody the leading principles upon which the numerous minerals found in nature are distinguished from each other and arranged in related groups. The unit in mineralogy is the species. A mineral species must have a definite composition and individual characteristics of form, sufficient to establish its difference from all others. The mode of occurrence may be gaseous, fluid, or solid; the nitrogen and oxygen of the atmosphere, water, and mercury are all native minerals, as well as the solid substances. But definiteness of composition is a necessary characteristic, and marks the difference between minerals and rocks. While the latter are composed of mineral substances, the indefiniteness of their constitution prevents their classification and description by the accurate methods known in mineralogy. Even in the latter science a certain latitude in composition is necessarily allowed, as minerals are seldom perfectly pure. Elements foreign to those which properly compose the mineral are nearly always present, and when their amount is large in proportion to the whole, it may be a question whether a new species should be made. The tendency of the best authorities is to restrict the number of species as much as possible, and to describe the modifications, where the usual characteristics of the mineral are not much altered, as varieties. Thus under pyroxene Prof. Dana describes 21 varieties, and under amphibole 20. Tourmaline has already been cited as a case of extreme variation in chemical composition, and calcite in crystalline form, the variation in both cases being in remarkably well characterized species. In the fifth edition of Dana's "Mineralogy" (1868), 838 species are described, and the number of varieties is probably two or three times as great. The classification of these species is based upon chemical composition; compounds of one kind, as silicates or sulphides, being placed together and subdivided into groups having the same general symbol, or the same crystalline form, or some common physical character. The arrangement according to composition will be understood by referring to the table of elements given above. Six general divisions are made: 1. Native elements, including any element in the pure state, and any compound of two elements in the same series and group. There are 20 elements known, forming 25 mineral species. Gold, silver, platinum, iridium, palladium, mercury, copper, lead, arsenic, antimony, bismuth, tellurium, sulphur, selenium, carbon, nitrogen, and oxygen are certainly found native; while

iron, zinc, and tin, though reported, are somewhat doubtful, if meteoric iron is excluded as not having been subjected to terrestrial conditions. When elements from two or more groups are united in a mineral, we are brought to the study of compounds, which forms all the remaining part of mineralogy, including five divisions. 2. All compounds in which the negative element is taken from the arsenic or sulphur group (series II. in the table). This division therefore includes phosphides, arsenides, antimonides, bismuthides, sulphides, selenides, tellurides, and double compounds, as sulph-antimonides, sulpho-bismuthides, &c.; in all, 110 species. 3. Compounds in which the negative element is taken from group A, series III., and therefore this division comprises all chlorides, bromides, and iodides, numbering 23 species. 4. Compounds containing the negative element of group B, series III., or fluorides, 13 in number. 5. Oxygen compounds, the negative element being taken from group C, series III. This division exceeds all others in the number of its species (587) and in the abundance of its minerals, which form probably more than nine tenths of the globe. 6. Those compounds of hydrogen and carbon which are called "organic," of which 73 species are recognized. In addition to the above, more than 100 new species have been reported since 1868, and though some of these may not be sustained, the interest taken in mineralogy as a speculative science is rapidly extending our knowledge of minerals and the discovery of new species.—A general classification of species having been made according to chemical composition, as above explained, groups are formed, each of which contains minerals of one type. A mineral type includes species which closely resemble each other in crystalline form, and have a related elementary composition. Thus eight similar compounds of protoxides and dioxides are found to crystallize in the isometric system, and are all of the "spinel type." Crystallized minerals containing ferric anhydride assume either inclined or hemihedral forms, and therefore constitute a well marked type. Amorphous minerals are necessarily classed with those crystalline species which they resemble in composition, as their lack of definite form is looked upon not as a characteristic, but as the lack of one. This mode of ranking them does no violence to the theory held by some that they are formed from matter in the colloidal state. No uniform system of comparison has yet been discovered which will suit the requirements of all classes of minerals. Each element appears to have a definite form, which it tends to assume under all circumstances; and if the strength of this tendency varies with each one, the form of any given species will either be that of some dominant element, or a compound one resulting from the interaction of all the substances contained in it. But nothing is known of such a scale of crystallographic forces except that, in the some-

what casual juxtapositions brought about by the present system of arrangement, we find different compounds, such as sulphates and carbonates, crystallized in different forms; while a species which is a compound of both these, a sulphato-carbonate, has the general form of the sulphates. From this fact it is concluded that sulphur has a more energetic formative power than carbon. An excellent and simple example of the principles on which mineral types and groups are arranged will be found in Dana's "Mineralogy," fifth edition, p. 34, under the head of "Sulphides."—*Nomenclature.* Mineralogists have chosen the termination *ite* to characterize the names of their species. *Itis* or *ites* was used by the Greeks and Romans for this purpose, and it was appended to some word signifying a quality, locality, or some other fact relating to the mineral. *Hæmatites*, for instance, referred to the red color of the powder, and *syenites* took its name from Syene in Egypt. Werner, in the last century, introduced the custom of naming minerals after persons, and, though much opposed for years, especially by French mineralogists, this is now the common usage. Its popularity does not spring so much from the desire to do honor to discoverers and distinguished men, as from the liability to error when an attempt is made to name a mineral from some supposed quality while the information about it is still imperfect. Many other terminations are in use, as *ine*, *ane*, *ene*, *ase*, *age*, *ome*, *ote*, &c.; but these have come down to us from former years. At present the rule is to use the termination *ite*, or if another is employed the latter must be applied to all minerals of the same class. A great advance in uniformity has been made by Dana, who undertook a thorough collation of the literature of the science, and applied the law of priority wherever it could be done without injury, thus restoring many old names. While *ite* is used for minerals, *yte* is used for rock masses, which, to deserve the application of the word, should consist principally or entirely of the compact mineral. Thus dolerite and pyroxenite are massive deposits of the minerals dolerite and pyroxene.—*Mineralology* is the name given to the study of the laws which govern the formation of minerals. While the chemist constantly endeavors to work with pure materials and to have but few elements present in the artificial production of mineral compounds, nature has undoubtedly formed many or all of the mineral species from sources in which a great number of elements were mixed. The circumstances under which these elements were brought together, their proportion, and the influences to which they were individually or collectively subjected afterward, must have varied within very wide limits; and the fact that definite and unvarying species have been produced from heterogeneous compounds is proof of the operation of fixed and probably simple laws. On the other

hand, the slight differences which are noticeable in the characteristic marks of a great many species are probably the traces of the different conditions under which the individuals of the species were formed. The development of these laws, and of the forces which have modified them, forms the speculative part of mineralogical science, and makes the science itself an important factor both in the history of the earth and in the development of chemical knowledge. The present state of this knowledge will not permit a trustworthy statement of mineralogical facts within the limits of this article. It is sufficient to point out some of the modes in which compounds may be formed. These are: 1, union of two gaseous elements; 2, union of one gaseous and one fluid or solid element; 3, union of two fluids; 4, union of one fluid and one solid; 5, combinations at a high temperature (igneous fluidity forming a matrix from which species separate on cooling); 6, combinations at a low temperature.—*Artificial Minerals.* By imitating these and other processes, many of the characteristic species may be reproduced, and the combinations always show themselves to be governed by the same laws that are discernible in the formation of true minerals. These artificial minerals mostly result from three sources: the study of chemical laws by experimental processes, the desire to produce gems by artificial means, and the casual formation of definite mineral compounds in metallurgical work. Of the salts which result from chemical reactions, a great number have been found in nature. Of minerals used as gems, the ruby, aquamarine, garnet, topaz, spinel, chrysoberyl, apatite, and others have been produced, but not of a size large enough to make them useful as ornaments or their manufacture profitable. Metallurgical processes, where high temperatures and the action of gaseous substances are long continued, and where compounds of all degrees of fusibility are melted and chemically combined, are a fruitful source of artificial and very perfect minerals. A few furnace products have never been found in nature. While artificial minerals are apt to be less perfectly crystallized than the native specimens, they are also apt to be of simpler forms, and have sometimes served to determine the primitive angle when it could not be decided by natural specimens.—*Historical.* While the ancients were acquainted with a great number of minerals, and observed the existence of crystals and the importance of physical characters, their complete ignorance of all our modes of investigation prevented their obtaining any real knowledge of the distinctive species. Stones of the most diverse composition, some minerals and some rocks, were grouped under one name, and it is frequently impossible to recognize from their description the minerals they knew. Theophrastus (315 B. C.) was the earliest writer on the subject, though other authors frequently referred to minerals as rem-

edies, usually of the miraculous kind. Passing to the Christian era, we find Pliny writing on this subject in the 1st century, and Dioscorides in the same or the following; after which there is a blank until the 11th century, when Avicenna divided minerals into four classes, stones, salts, sulphurous or inflammable bodies, and earths. The "stones" were chiefly silicates, and rude as this classification is, it was not until long after chemical science had made its mark that anything very much superior was advanced, the principal improvement made in more than six centuries being the substitution of metals for "stones." Agricola (1543-'50) wrote several works, studied the external characters of minerals, and based his arrangement upon those which are apparent to the senses. The alchemical studies of the succeeding centuries bore some fruit, both in the discovery of new species and in the addition of heating and fusion as modes of investigation. Passing over Linnaeus (1735) and Wallerius (1747), who was the first to write a systematic descriptive work on this subject, we come to Cronstedt of Sweden, who in 1758 first pointed out the distinction between rocks and minerals which now enters into the fundamental definition of the latter. He based his system upon chemical properties. Romé de Lisle, in 1772-'83, made the first systematic effort to apply the principles of crystallography to the science, though Nicholas Steno had in the preceding century pointed out the fundamental fact that, with all their variations of form, the faces of crystals preserved the same angular relations; and later Guilielmini discovered that cleavage gave constant forms. Werner of Freiberg published in 1774 a work on the "External Characters of Minerals," in which he gave a much needed precision to the descriptive part of mineralogy, and retained the "natural affinity," or chemical composition, as the grand basis of classification, though the mode of carrying out the idea recalls Avicenna's work, seven centuries before. Werner also made four classes, earths, salts, inflammables, and metals, the first named being further divided into silicious, argillaceous, calcareous, and talcose; but the silicious division was made to include nearly all the hard minerals, without regard to composition. It was under this form that mineralogy was introduced to English students by Kirwan in 1784. The science now began to receive constant and important additions, the three modes of determination which still remain criteria (crystalline form, chemical composition, and physical characters) being each in turn elevated to a position of dominant importance. In 1783 De Lisle published a second edition, in which crystallography received increased attention; and in 1801 Haüy's *Traité de minéralogie* appeared, in which crystallography was made the principal agent in the determination of mineral species. He rediscovered the importance of cleavage, and afforded

a mathematical explanation of the phenomenon, referred the numerous secondary forms to a fundamental molecule of invariable shape, and reduced all crystal forms to six systems, based upon the following forms: 1, the regular octahedron; 2, the rhombohedron; 3, octahedron with a square base; 4, the octahedron with a rectangular base; 5, the prism with a symmetrical oblique base; and 6, the prism with an unsymmetrical oblique base. By reference to the article CRYSTALLOGRAPHY it will be seen that, though the details of his system have been changed, the axial differences recognized by him remain. In his system chemical composition and physical characters were entirely subordinate to crystallographic habits. He made four classes: 1, free acids; 2, substances which are metallic but do not present a metallic appearance, in which were included the eight genera, lime, barytes, strontites, magnesia, alumina, potash, soda, and ammonia, together with the silicates; 3, metallic substances; 4, unmetallic combustible substances. In 1804 Mohs of Vienna published a description of a collection of minerals, in which the external characteristics alone were used to describe them. In 1820 he expanded his ideas into a "Natural History" system, the object of which was to group together all minerals which presented similar characters in regard to taste, lustre, gravity, streak, hardness, &c. No tests were used which destroyed the mineral, such as acids and fusion. Each group was gradually reduced by a process of comparison and exclusion to its individual members. This method was borrowed from other fields of science, and its nomenclature repeated the classes, orders, and genera of zoölogy and botany. The system, though it has proved to be entirely unfitted to this science, did much good by requiring greater precision in description, bringing out many true relationships between species, and discarding unimportant distinctions which were flooding the science with false species. It is still used, with modifications, in mineralogical keys which are constructed for the use of young students, and persons little versed in the study. Mohs's classification included three classes: class 1 contained four orders, gas, water, acid, and salt, and included bodies which have taste, give no bituminous odor, and have a gravity below 3.8; class 2, bodies which have no taste, but are of specific gravity above 1.8; class 3, fluid bodies with bituminous odor, and tasteless bodies of specific gravity below 1.8. This system was received with great favor, and not only held sway in Germany for 40 years, but extended into England and America. Two of the modes of determining minerals, crystalline form and physical characters, had now received the attention of able advocates, and were in rapid process of development by mineralogists throughout the world. The third, that which stands at the head in the present system, is chemical composition, which received from

Berzelius some time before 1816 (French edition, 1819) its first decisive impetus. That chemist looked upon mineralogy as properly a mere branch of his own favorite science. He explained mineral as he explained other compounds on the dualistic theory, according to which they were made up of an electro-positive and an electro-negative element or radical. His classification included two great groups, the first composed of native metals and binaries, not containing oxygen; and the second of electro-positive and electro-negative oxides, hydrates, silicates, alumina-silicates, tungstates, borates, carbonates, &c.; each acid, or each electro-negative element, having its own division as now. He introduced into the science the exact methods of chemistry, and urged the necessity of constant analysis, so that the existing mode of mineralogical study is known as the Berzelian, improved by the addition of crystallography and the special study of external marks.—While the science was thus receiving constant accessions in Germany and Sweden, the French mineralogists were also working out various schemes of classification. Unable to produce a harmonious arrangement on any simple plan, they adopted a mixed system. Brongniart, in his *Traité élémentaire* (1807) and *Tableau des espèces minérales* (1833), classified the earthy minerals according to the negative element, and the metallic ones according to the positive element. He had two grand divisions, the inorganic and organic. In the first were included 20 “mineralizers,” such as oxygen, hydrogen, and sulphur; the second class, *métaux autopsides*, contains true metals and their compounds; while the third class, *métaux hétérospides*, contains other bases and forms two orders, one of compounds without, and one of those with an acid. Beudant, in his *Traité de minéralogie* (1824), endeavored to restrict the classification of minerals to their chemical reactions. He formed three grand genera, based upon the characteristic negative element. Gazolytes contained a negative element capable of forming stable gaseous compounds with oxygen, hydrogen, or fluoric acid, and included carbon, silicon, chlorine, &c. Leucolytes contained a negative element which does not form such stable gaseous compounds, but gives colorless solutions with acids. Chroicolytes, on the other hand, give colored solutions with acids. Though this arrangement supplanted that of Haüy, the groupings of minerals formed under it were of the most heterogeneous character. Dufrénoy in 1844 published the first edition of a treatise in which a mixed system was again presented. He recognized natural groups in some of which the bases bore the important part, and in others the acids. In these mixed systems the bases are the real ground of classification, but the importance and number of the silicates, and the fact that the base plays a secondary part in most of them, compel an exception to be made in their favor in any scheme where the

bases are made the characteristic elements. The French school has always been distinguished for eminence in crystallographic and physical researches, the latest development of which is to be seen in Descloizeaux's admirable investigations into the optical properties of minerals, by which the recognition of many obscure species has been greatly aided. The mixed classification of the French, however, has been rejected, partly for its incongruity and partly because the new chemical methods have been altogether in favor of the Berzelian mode.—In 1840 Gustav Rose of Berlin published a work on crystallography, in which the six crystalline systems formed the general divisions, in each of which the minerals were arranged in genera and species, according to their chemical composition. In 1852 he published his *Krystallo-chemisches Mineralsystem*, in which the chemical composition is used both to determine the general arrangement and to fix the individual species, which are grouped into genera by their crystallographic characters. His method of arrangement was: 1, simple bodies; 2, compounds of sulphur, selenium, tellurium, arsenic, and antimony; 3, compounds of chlorine, fluorine, iodine, and bromine; 4, oxygen compounds. Rammelsberg, in several works, and especially in his *Handbuch der Mineralchemie*, has paid great attention to the constitution of minerals, their relationships, the laws regulating their formation, and similar questions. K. G. Bischof, in his *Lehrbuch der chemischen und physikalischen Geologie*, entered into the genesis of minerals, and, though his views have been frequently rebutted, he exerted a marked influence upon the progress of the science. Germany continues to be one of the most active fields for the advancement of this science. Tschermak, Leonhardt, Hessenberg, and others issue periodical reviews of progress, mineralogical magazines are published, and a great number of works on the science in all its branches are constantly issued. The German school now probably includes a greater number of distinguished names than any other, though the science is rapidly advancing in all countries.—In the United States mineralogy had been but little cultivated before the beginning of the present century. A few collections of minerals had been brought from Europe, but the treatises of Kirwan and Jameson were almost the only works that could be consulted with reference to them, and very few were acquainted with these. In 1816 Prof. Parker Cleaveland of Bowdoin college published “An Elementary Treatise on Mineralogy and Geology,” which was well received both in America and in Europe as a work of scientific importance, and particularly useful for the information it afforded respecting American minerals. The author, following the general plan of Brongniart at that time, sought to unite with the precise descriptive language of the system of Werner the chemical classification of the French mineralogists. His work was

for many years highly popular, and indeed almost the only one in use by American mineralogists. A second edition appeared in 1822. Ten years afterward Prof. Charles U. Shepard of New Haven published the first part of his "Treatise on Mineralogy," and in 1835 the second part. He adopted the arrangement of Mohs with little variation, making the natural history or external characters as far as possible the means of determining the species. He however appended a table in which the minerals were also arranged according to their chemical affinities. Francis Alger of Boston republished the then recent "Treatise on Mineralogy" prepared by Robert Allan from Phillips's "Mineralogy," enlarging it by numerous notices of American minerals and of recent discoveries. Like the last named work, it was particularly interesting for presenting many new facts in the development of the mineralogy of the United States. Prof. James D. Dana of New Haven commenced in 1837 the publication of his treatises upon mineralogy by the issue of the first edition of "A System of Mineralogy, including an extended Treatise upon Crystallography." Five editions of this work have been published. In those of 1837 and 1844 the natural history system of Mohs was extended and solidified, but in the third edition this was abandoned, and the author presented his work with a classification that claimed no inherent virtue but convenience. He however suggested a combination of the chemical and crystallographic methods, which in 1854 was embodied with alterations in a fourth edition. During the 17 years covered by this work the views of the English school of chemists were steadily gaining ground, and when the fifth edition appeared in 1868 the "new chemistry" with its rational symbols and its new tenets had been established, and was used by the side of the old method in this work. The system employed is explained in the foregoing part of this article. No attempt is made to afford students a tabular arrangement by which the name of given specimens can be ascertained. The book bears to minerals a relation similar to that which a dictionary bears to words; it gives accurate definitions of them on a systematic plan. Great care has been taken with these definitions, and in fact Prof. Dana's method does not commence with the system, but with the species. When all the facts of composition, crystal form, and physical characters of a species are known, it can readily be placed with those of a similar kind, and minerals which resemble each other in these things necessarily form a group. Partial differences give rise to sub-groups, and resemblances between entire groups cause the formation of divisions. The system is therefore strictly rational. In other respects Dana's fifth edition is a great advance upon any previous publication in this branch of science. He has adopted fixed rules for nomenclature and orthography, collated almost every work for sy-

nonymes, which are arranged in chronological order, and performed much similar work in a way that seems to leave nothing to be desired.

MINERAL POINT, a city and the capital of Iowa co., Wisconsin, on a branch of the Pecatonica river, 47 m. W. S. W. of Madison, and at the terminus of the Mineral Point railroad (83 m. long), connecting it with the Illinois Central railroad at Warren, Ill.; pop. in 1870, 3,275. It is in the midst of a rich mineral region, yielding lead, copper, and zinc, and contains several hotels, numerous stores, foundries, smelting works for lead and zinc, and breweries. There are eight public schools, including a high school, three private schools, two weekly newspapers, and five churches.

MINERAL SPRINGS, those which are impregnated with minerals to such a degree as to possess medicinal properties. They differ from ordinary springs by the larger volume of gases, especially carbonic acid gas, the mineral ingredients held in solution in their waters, and the peculiar smell, taste, and sometimes color imparted by the solution; many of them also by a higher temperature, called thermal springs (75° to 122° F.). Some issue from the earth like fountains, foaming and steaming; others with a continuous or intermitting noise, gurgling and hissing. Like ordinary springs, they are found at every altitude and in all climates. Some break at boiling heat through a crust of ice and snow, and some issue with almost icy coldness from among luxuriant vegetation. Many sulphur springs destroy all vegetation around them; others (calcareous) cover organic structures with incrustations. The waters of mineral springs are used both for drinking and bathing; their vapors for baths; and their spray, with the evolved gases, for inhaling. The ancients ascribed supernatural properties to mineral springs, and their priests, especially those of Æsculapius, placed their sanctuaries near them, as at the alkaline springs of Nauplia and the gas springs of Dodona. Such places were provided not only with baths, hospitals, and medical schools, but also with theatres and other resorts for amusement, and were designed both for worship and for the cure of the sick. According to Strabo, the springs of Hierapolis imparted a red color to the roots of trees and shrubs, and the juices of the latter mixed with the water produced a purple dye. Philostratus says that the Greek soldiers wounded in the battle on the Caicus were healed by the waters of Agamemnon's spring near Smyrna. The pythoiness was thought to be inspired by bathing in the Castalian spring and inhaling the vapors of the steaming cave at Delphi. Josephus relates that Herod sought relief from his terrible disease in the thermal springs of Callirrhoe. The springs of Tiberias, which have a temperature of from 86° to 130° F., were used by the Romans, and are still frequented by patients from all parts of Asia Minor. The most celebrated bathing place of the Roman empire was the hot sulphur springs.

(190° F.) of Baiæ on the gulf of Naples. Ischia, once covered with the villas and palaces of the Romans, still maintains the reputation of its thermal waters and vapor baths. The Romans discovered many of the most important thermal springs of Europe, and used them as army stations; among them are Baden-Baden, Wiesbaden, Bath, Aix-la-Chapelle, and Spa. Carlsbad was named after Charles IV., who is said to have discovered the Sprudel in 1347 or 1358, while hunting.—Many theories, both natural and supernatural, have been propounded by philosophers in all ages to account for the origin and properties of mineral springs; but modern analytical chemistry has dissolved the demons of the ancients and the wild spirits of Paracelsus (*De Aquis Mineralibus*, 1562) into our familiar carbonic acid gas. Van Helmont's discovery of the alkalies and fixed air in the early part of the 17th century was the first step in this direction. Arago proved that the temperature of the springs corresponds with the depth from which they rise. Bergman, Berzelius, Bischof, and Struve showed that their composition depends on the amount of carbonic acid and other gases which are dissolved in them, consequent on their volcanic origin and on the nature of the rocks which they permeate; and Faraday, Liebig, and other chemists established the principles of a thorough analysis. During the past 50 years many mineral springs have been discovered, and all of note have repeatedly been analyzed. These analyses vary in their results with the changes to which the various springs are from time to time subject. The waters of the Kissingen Rakoczy spring lost 22½ per cent. of mineral ingredients from 1830 to 1855, and underwent a change also in their relative proportions. At the time of the great earthquake of Lisbon (1755) the Carlsbad springs ceased flowing for three days.—Of the mineral springs of Europe, France contains about 900; Germany, Austria, and Switzerland, about 2,500; England, over 100; Spain, 1,200; Portugal, 200; and Italy, 300, two thirds of which are in Tuscany. The most important constituent of the waters of all spas, as mineral springs are frequently called, is carbonic acid gas, with which the muriated and muriated-alkaline springs are impregnated most, the saline, alkaline, and bitter waters least. According to Liebig, Kissingen Rakoczy contains in 16 oz. 41·77 cubic inches of carbonic acid, Carlsbad 14, and Kissingen bitter water only 5·9. Nitrogen gas occurs especially in hot sulphur springs, with carburetted hydrogen, oxygen, and sulphuretted hydrogen as lesser gaseous ingredients. Mineral springs are classified as follows, according to the salts from which they derive their specific importance. 1. *Chalybeate or Ferruginous Springs*. The distinguishing characteristic of these is the presence of iron dissolved as a bicarbonate, or in the inferior ones as a sulphate. Their other ingredients are bicarbonates of manganese, soda,

lime, and magnesia, chloride of sodium, sulphate of soda and of potash, &c. Their water, which has an inky taste, is most effective as a remedy for anemia and chlorosis, by augmenting the number of blood globules and their hæmatine, and by diminishing the phosphoric acid in the urine. The strongest chalybeate spring, Schwalbach in Germany, contains much carbonic acid gas, and, with the exception of iron, only a small amount of saline ingredients. Other chalybeates of note are Pyrmont, Altwasser, Reinerz, Brückenan, Steben, Driburg, Wildungen, Cudowa, and Franzensbad, in Germany and Cisleithan Austria; Buziás, in Hungary; St. Maurice, in the Engadine, Switzerland; Spa, in Belgium; Passy, Forges, Bussang, Plombières, Bagnères-d'Adour, and Dinant, in France; Cheltenham, Tunbridge, Scarborough, and Wells, in England; Bibiana, Catarina, Staro, and La Croix, in Italy; and Loka, in Sweden. In the United States the most noted chalybeate springs are: Schooley's Mountain springs, Morris co., N. J.; Fry's soda spring, near Mt. Shasta, Cal.; Stafford springs, Tolland co., Conn.; Greencastle springs, Putnam co., Ind.; Catoosa springs, Catoosa co., Ga.; Schuyler county springs, Ill.; Owasso springs, Shiawassee co., Mich.; Cooper's well, Hinds co., Miss.; Beersheba springs, Grundy co., Tenn.; Rawley springs, Rockingham co., Va.; and Bayley springs (alkaline-chalybeate), Lauderdale co., Ala. Dr. Walton includes also in this class the so-called alum waters of Virginia, viz.: the Rockbridge, Pulaski, and Bath alum springs; Stribling springs in Augusta co.; Church Hill alum springs, near Richmond; Bedford alum springs, near New London; and Variety springs in Augusta co.; also the Oak Orchard acid springs, Genesee co., N. Y., and the Tuscarora sour springs, Wentworth, co., Canada. He also names, as calcic-chalybeate waters, the sweet chalybeate springs, Alleghany co., Va.; Montvale spring, Blount co., Tenn.; and Hot Red springs (103° F.), Utah. Many iron waters are strongly impregnated with saline or alkaline chalybeates, and will be mentioned in speaking of saline and alkaline springs. 2. *Muriated Springs*. In these there is an excess of chloride of sodium and of carbonic acid gas, and they are mainly diuretic, or, according to Hanbury Smith, tonic and aperient, and effective in scrofulous and abdominal diseases, chronic rheumatism, and cutaneous complaints. According to Liebig, 16 oz. of Kissingen Rakoczy, the representative water of this class, contains chloride of sodium 44·7 grains, chloride of potassium 2·2, chloride of lithium 0·15, magnesium 2·33, bromide of sodium 0·064, nitrate of soda 0·07, sulphate of magnesia 4·5, sulphate of lime 2·99, carbonate of magnesia 0·13, carbonate of lime 8·1, protoxide of iron 0·24, phosphate of lime 0·043, silica 0·99, ammonia 0·007, and traces of iodide of sodium, borate of soda, &c. Springs allied to it are Rodna in Transylvania, Homburg (muriated-chalybeate), the tepid waters of

Soden, and the thermals of Baden-Baden and Wiesbaden, in Germany. Diseases of the skin and scrofula are cured by the muriated saline or brine springs, of which the principal are: Rehme, Naheim, Salzgungen, and Creuznach, in Prussia; Ischl and Hall, in Austria; Reichenhall, in Bavaria; and Bourbonne-les-Bains, Bourbon-Lancy, Bagnolles, St. Honoré, Clermont-Ferrand, St. Laurent-les-Bains, and others, in France. The most celebrated muriated saline springs in the United States are those of Saratoga (49° to 51° F.), Congress water having about the strength of Kissingen Rakoczy, but a milder taste, while the Hathorn spring contains more chloride of sodium. Some of the springs are chalybeate, others sulphurous or iodinous, and all are highly charged with carbonic acid gas. The Saratoga Seltzer resembles the celebrated Seltzer (properly Selters) in Germany; and the Geyser, bored in 1870, is so highly charged with carbonic acid gas that it foams like soda water when drawn from a faucet. The following analysis of one pint each of the water of four of the principal springs at Saratoga is from Dr. Walton:

CONSTITUENTS.	High Rock.	Congress.	Hathorn.	Geyser.
	grains	grains.	grains.	grains.
Carbonate of soda.....	3.024	0.934	0.872	6.175
" magnesia.....	4.069	9.019	18.072	10.322
" iron.....	0.135	0.081	0.101	0.089
" lime.....	11.443	12.449	14.815	14.793
" lithia.....	0.154	0.374	.....	0.549
" strontia.....	trace.	trace.	trace.	0.041
" baryta.....	0.050	0.095	0.178	0.206
Chloride of potassium.....	1.122	1.006	1.199	3.079
Chloride of sodium.....	48.766	50.055	63.746	70.260
Sulphate of potassa.....	0.201	0.111	trace.	trace.
Phosphate of soda.....	trace.	0.002	0.001	trace.
Iodide of sodium.....	0.011	0.017	0.025	0.081
Bromide of sodium.....	0.091	1.069	0.1192	0.276
Alumina.....	0.153	trace.	0.016	trace.
Silica.....	0.233	0.105	0.137	0.013
Total.....	69.502	75.267	93.874	105.804
Carbonic acid gas, cu. in.	51	49	47	57

There were also traces of fluoride of calcium, bichlorate of soda, and organic matter. Saratoga waters possess tonic and cathartic properties, and are therefore especially adapted to cases of dyspepsia, jaundice, calculus, and engorgement of the liver. (See SARATOGA SPRINGS.) Allied springs are: Congress spring, Santa Clara co., Cal.; Rockbridge baths, Rockbridge co., Va. (74° F.); Capon springs and bath, Hampshire co., W. Va.; Artesian well, St. Louis, Mo. (2,199 ft. deep); Spring Lake well and Fruit Port well, Ottawa co., Mich., which much resemble the celebrated waters of Creuznach, Prussia; and St. Catharine's wells, Ontario, Canada, also similar to Creuznach, but stronger. Plantagenet or Caratraca and Caledonia springs, in the same province of Canada, are fine types of iodo-bromated saline waters. 3. *Sulphur Springs.* These are impregnated with nitrogen and sulphuretted hydrogen gas. Cold sulphur springs are indicated as effective in catarrhal affections of the lungs and throat, and in hem-

orrhoids. Such are Weilbach, Nenndorf, Eilsen, Langenbrücken, in Germany; Stachelberg in Glarus, Switzerland; Montmorency, La Roche, and St. Amand, in France; Harrowgate, Tyne-mouth, and Butterby, in England; and many in Italy. Thermal sulphur springs are recommended in rheumatism and gout. Among these are Aix-la-Chapelle and Burtscheid (Kochbrunnen, 156° F.), in Prussia; Baden, near Vienna; Baréges, Bagnères-de-Luchon, Eaux-Chaudes, Arles, St. Sauveur, Ax, Digne, and Aix-les-Bains, in France; Abano, Ponti, Sessame, Valterra, Viterbo, Pozzuoli, Castellamare, &c., in Italy; Baden and Schinznach, in Switzerland; Méhádía and Trencsény-Teplitz, in Hungary; the Caldas of Rainha and Gerez in Portugal, and of Orense and Lugo, in Spain; and Ram-lösa, in Sweden. The principal cold sulphur springs in the United States are: Alpena well, Mich.; Cold White Sulphur springs, Rock-bridge co., Montgomery White Sulphur springs and the Seven Fountains or Burner's springs, Shenandoah co., Red Sulphur springs, Monroe co., and Greenbrier White Sulphur springs and Greenbrier Blue Sulphur springs, Green-brier co., W. Va.; Sharon springs, Schoharie co., Richfield and Cherry Valley springs, Otsego co., Avon springs, Livingston co., and Columbia springs, Columbia co., N. Y.; Bedford springs, Trimble co., Esculapia springs, Lewis co., Fox springs, Fleming co., and White Sulphur and Tar springs, Breckenridge co., Ky.; De Soto springs, La.; Green Cove springs, Clay co., Fla.; Red Sulphur springs, Walker co., Ga.; and French Lick springs, Orange co., Ind. The Sandwich springs, Ontario, Canada, are also of this class. Of saline sulphur waters, applicable especially to the treatment of dartsous or herpetic diseases of the skin, the most noted are: West Baden springs, Orange co., Indian springs, Martin co.; Lodi Artesian well, Wabash co., and Lafayette well (55° F.), Tippecanoe co., Ind.; the upper and lower Blue Lick springs, Nicholas co., Big Bone springs, Boone co., Paroquet springs, Bullitt co., and Olympian springs, Bath co., Ky.; Blount springs, Ala.; Massena springs, St. Lawrence co., N. Y., which resemble those of Eilsen, Germany; and Salt Sulphur springs, Monroe co., W. Va. Of calcic sulphur waters, prescribed in cases which otherwise would require sulphur waters, but which are complicated by disease of the bladder, the principal springs are: Chittenango springs, Madison co., and Clifton springs, Ontario co., N. Y.; and Yellow Sulphur springs, Montgomery co., Va. The principal thermal sulphur springs in the United States are: Calistoga hot springs, Napa co. (about 60 springs, varying from lukewarm to boiling hot), the Geysers, Sonoma co. (about 100 springs, varying from 97° to 195° F.), Paso Robles hot springs, San Luis Obispo co. (112° to 122°, and allied to the waters of Aix-la-Chapelle), Santa Barbara hot sulphur springs (60° to 130°), and Agua Caliente or Dr. Warner's ranch spring (136° to 142°), San Diego co., Cal.; Louisville

artesian well (76½°), Ky.; Middle Park hot sulphur springs (111° to 116°), Summit co., Col.; Salt Lake hot springs (110° to 128°), Salt Lake City, Utah; Warm springs (90°), Merriwether co., Ga.; Warm springs (96° to 98°), Bath co., Va.; and the Geysers or Warm Sulphur springs (96° to 104°), about 20 m. from Sitka, Alaska. 4. *Alkaline Springs*. The waters of alkaline springs increase, by their excess of carbonate of soda, the alkalinity and fluidity of the blood. Their action is diuretic, and they are efficacious in all affections of the kidneys, in catarrhs, in affections of the stomach, bladder, and abdomen, and in indigestion, jaundice, gout, and diabetes. According to Bauer, 16 oz. of the water of the Grande Grille (107°) of Vichy contains carbonate of soda 29.19 grains, carbonate of lime 1.92, ammonia 0.036, strontia 0.0178, magnesia 0.27, sulphate of potash 1.567, soda 0.9, phosphate of soda 0.032, and chloride of sodium 4.445. The Josephsquelle of Bilin, Bohemia, contains about 23 grains of carbonate of soda in the same quantity of water. Other noted alkaline springs are Buda, in Hungary; Vals, Aix, Chaudes-Aigues, Nérès-les-Bains, and Luxeuil, in France; Gieshübel near Carlsbad, Fachingen, Geilnau, and the muriated alkaline or acidulous springs of Selters, Ems, and Salzbrunn, in Germany; Bristol, Buxton, and Dunblane, in Great Britain; Camarès, in France; Ischia, Asciano, and Nocera, in Italy. The principal constituents of the famous Selters and allied waters, used in acute catarrh and pulmonary affections, are chloride of sodium, carbonate of soda, and carbonic acid gas. The principal alkaline springs of the United States are: Bladon springs, Choctaw co., Ala.; California Seltzer springs, Mendocino co.; Perry springs, Pike co., and Versailles springs, Brown co., Ill.; St. Louis springs, Gratiot co., Mich.; Sheldon springs (including the Missisquoi spring), Franklin co., and Weldon springs, St. Albans, Vt.; and the newly discovered Des Chutes hot springs (143° to 145°), Wasco co., Oregon. 5. *Alkaline Saline Springs*. The waters of these springs are most efficient in diseases of the liver and abdominal plethora, obesity, gout, and calculus. Their representatives are the thermal springs (117½° to 165°) of Carlsbad in Bohemia, nine of which are in use. The famous Sprudel, which used to spout 18 to 20 times a minute, rising from 4 to 8 ft., contains, according to Berzelius and Bauer, in 16 oz., sulphate of soda 19.28 grains, chloride of sodium 7.97, carbonate of soda 10.13, carbonate of lime 2.37, carbonate of magnesia 1.369, carbonate of lithia 0.02, and fluoride of calcium 0.024. To this class belong the curative cold waters of Marienbad in Bohemia, Rohitsch in Styria, and the thermal Bertrich in Rhineland; Dax, Bagnères-d'Adour, and Ussat, in France; and Bath and Matlock, in England. In the United States the chief springs of this class are: Lansing well, Ingham co., Mich.; Ballston Spa, Saratoga co., and the Albany artesian well (500 ft. deep), N. Y.; Mil-

hoit's soda springs, Clackamas co., Oregon; and the thermals, Idaho hot springs (85° to 115°), Clear Creek co., Col., and Charleston artesian well (87°, 1,250 ft. deep), Charleston, S. C. 6. *Purgative or Bitter Waters*. These waters derive their latter name from the taste of their chief ingredients, sulphate of soda (Glauber's salts) and sulphate of magnesia (Epsom salts). When taken in moderate doses they act as gentle purgatives and strong diuretics, and are useful therefore in all cases requiring active saline purgation. They are especially applicable to persons of robust constitution, with a tendency to abdominal plethora. The Kissingen bitter water contains, in 16 oz., sulphate of soda 46.51 grains, sulphate of magnesia 39.55, chloride of sodium 61.10, chloride of magnesium 30.25, chloride of ammonium 0.02, and chloride of lithium 0.09. Friederichshall in Saxe-Meiningen, Pullna, Seidschütz, and Seidlitz in Bohemia, Epsom in England, Campagnetur-Aude in France, and Ivándá in Hungary, are famous bitter waters. Of springs of this class in the United States, Crab Orchard springs, Lincoln co., Ky., produce the Crab Orchard salts, which are made by boiling down the water. Estill or Irvine springs, Estill co., Ky., are strongly impregnated with sulphate of magnesia. Harrodsburg springs, Mercer co., Ky., are modified in their laxative effect by equal amounts of sulphate of lime and of carbonate of iron. Bedford springs, Bedford co., Pa., are purgative-chalybeate. Allied waters are: Beer springs, Oregon; Midland well, Midland co., Mich.; and Elgin spring, Addison co., Vt. 7. *Calcic Springs*. These are rich in carbonate of lime (limestone), or sulphate of lime (gypsum), mixed with iron, and with saline, alkaline, and other ingredients. Bathing in these waters cures exanthema, indigestion, and rheumatic and gouty affections. Drinking them, especially those rich in carbonate of lime and carbonic acid, such as the Wildungen water, proves beneficial in catarrh of the bladder, gravel and calculus, and in gastralgic dyspepsia. The following calcic thermal waters are regarded as of great therapeutical value: Leuk (123°), canton of Valais, and Weissenburg (tepid), in Bern, Switzerland; Lucca and Montione, in Italy; and in the United States, San Bernardino hot springs (100° to 172°), Cal.; Agua Caliente (130°), Mesilla co., N. M.; Sweet springs (74°), Monroe co., W. Va.; Berkeley springs (74°), in Bath, Morgan co., W. Va.; Warm springs (97° to 102°), Madison co., N. C.; and Bethesda springs (60°), Waukesha, Wis. (calcic-alkaline, efficient in urinary diseases). The principal cold calcic springs are: Wildungen, Waldeck, Germany; Contrexéville, Vosges, France; in the United States, Butterworth springs, Kent co., Leslie well, Ingham co., Eaton Rapids wells, Eaton co., and Hubbardston well, Ionia co., Mich.; Yellow springs, Greene co., Ohio; and Gettysburg springs, Adams co., Pa. 8. *Indifferent Thermal Springs*. This class contains but small

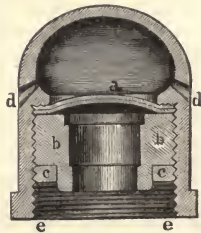
amounts of salts and alkalines, the beneficial effect of bathing in their waters resulting mainly from their increased temperature (75° to 160°). These baths are efficacious especially in paralysis, articular and muscular rheumatism, old wounds, enervation, and decrepitude. The most noted are: Gastein, in Salzburg, Austria (eight springs, from 87° to 160°); Wildbad, in Würtemberg; Pfäfers and Ragatz, in Switzerland; Teplitz and Johannesbad, in Bohemia; Warmbrunn and Landeck, in Prussian Silesia; Schlangenbad, in Hesse-Nassau, applicable especially to hysteria and skin diseases; Plombières, Vosges, France, efficacious in gastralgia, rheumatism, and dartrous diseases of the skin; Bains, in Alsace; Alhama de Granada, in Spain; and San Martino, in Lombardy. In the United States the most noted of this class are: Hot springs (57 springs, from 93° to 150°), Hot Springs co., Ark., which resemble those of Gastein and Pfäfers; Healing springs, Bath co., Va., applicable to all ulcerated conditions; Hot springs (102° to 108°), Bath co., Va.; Tuscan springs (76°), Shasta co., Cal.; Holston springs (66½°), Scott co., Va.; and Lebanon springs, Columbia co., N. Y.—No complete analysis has yet been made of some valuable cold springs, such as the 16 Birchdale springs, near Concord, N. H., the waters of which are alterative, diuretic, and aperient; Parkersburg mineral wells, Wood co., W. Va., the principal constituents of which are sulphate of magnesia and sulphate of soda; Clarendon springs, Rutland co., Vt., used as a remedy in gravel, dyspepsia, and engorgement of the liver; Alleghany springs, Montgomery co., Va., and Shannondale springs, Jefferson co., W. Va., calcic waters. In F. V. Hayden's "Preliminary Report of the United States Geological Survey of Montana," &c. (Washington, 1872), Dr. A. C. Peale, the mineralogist of the expedition, gives a catalogue of the thermal springs met with, among which he enumerates 10 chalybeates, averaging 129°, near Ogden and the Great Salt lake, Utah; of calcareous springs, 5 in Lincoln valley, near Fort Hall, Idaho (75°), 6 in Madison co., Montana, 16 on Gardiner's river, Wyoming, and 1 on the east fork of the Yellowstone (111° to 142°); 15 sulphurous and acidulous springs (151° to 171°) in the same tract; 6 sulphur and chalybeate springs (181°) on Yellowstone lake; 60 salses or mud volcanoes and sulphurous springs (173° to 184°) near Mt. Washburn and Turbid lake, Yellowstone valley; 17 salses (175° to 178°) on Crater hills and Steamy point, Yellowstone valley; 49 silicious (155° to 166°) on Yellowstone lake and Madison river; a great number of carbonated or soda springs (50°) on Bear river, Utah; and 400 geysers and silicious springs (157° to 184°) in the geyser basin of the National park.—*Uses.* Mineral waters are considered applicable to the treatment of chronic diseases only, as a rule, and are to be used during the inactivity of the disease. Medical advice is indispensable

in their selection and use, as change of air, diet, &c., are important coagents. Excesses of the table should be rigidly avoided during the treatment. The waters are usually taken before breakfast, the dose being gradually increased from one to four tumblers; but iron and alkaline waters may be taken several times a day, the latter with great advantage at bedtime. In some parts of France and Switzerland it is customary to drink while sitting in the bath, the usual time being two hours after breakfast. The stomach should be empty when the bath is taken. The regular temperature of the cold bath is 70° F. and below; of the warm bath, 92° to 98°; and of the hot bath, 102° to 110°. In the vapor and Russian bath the temperature is raised to 160°, and in the hot-air and the Turkish bath to 176°. The temperature of the body is so increased in these baths that the sudden transition to the cool shower bath and douche is soothing, and is followed under favorable conditions by copious perspiration. The mineral mud bath (85° to 100°) consists of mud taken from the marshy ground about the source of mineral springs. It is used chiefly in diseases of the skin, chronic rheumatism, and affections of the joints. When the symptoms of the "bathing crisis" appear, the use of mineral waters should be discontinued for a few days. A "small" or short cure requires three or four weeks, a "great" one five or six weeks. Mineral waters can be taken with benefit at any time of the year, but the season generally begins in May or June, and ends, according to the local climate, in September or October. After a season at the springs, the vineyards of Bingen, Dürkheim, Vevay, Montreux, and Meran are resorted to by many patients for an additional grape cure, the effect of which is generally cathartic.—For accounts of the mineral springs of Europe, see Durand-Fardel and E. Le Bost, *Dictionnaire des eaux minérales* (Paris, 1860); Althaus, "The Spas of Europe" (London, 1862); and in German, the works of Garless (1848), Posner (1853), Lersch (1855-'60), Weller (1860, who also publishes a yearly guide, *Wegweiser*), H. Helft (1862), Braun (1869), T. Hirsfeld (*Der Cur-Salon*, 1866-'72), and R. Rentwig (*Badezeitung*, 1869-'72). For the springs of the United States, see Bell; "Mineral and Thermal Springs of the United States and Canada" (1855), and Walton, "The Mineral Springs of the United States and Canada, with Analyses and Notes of the prominent Spas of Europe" (1873).

MINERAL WATERS, Artificial, imitations of mineral spring waters, made by dissolving the salts which constitute the basis of the natural mineral waters in ordinary water impregnated with gases, especially carbonic acid gas. Experiments in their manufacture were made as early as the 16th century, but they have been produced in perfection only within the past 50 years, since chemical analysis has become an operation of minute exactness. The merit of the discovery of their principles belongs to

Berzelius and the German physician Struve; but the latter, who proved the practical value of the invention, and founded, as Berzelius did in Stockholm, the first manufactories or spas in Dresden (1818-'20), Leipsic, Hamburg, Berlin, St. Petersburg, and Brighton, is deservedly called the father of artificial mineral waters. By powdering the clinkstone of Bilin and subjecting it to the action of carbonic acid water, under a slight hydrostatic pressure, he produced a mineral water identical with that of the natural spring of Bilin. Faraday and Liebig pronounced his artificial Carlsbad and Friedrichshall bitter waters to be identical in chemical composition and physiological action with the natural waters which they represented. Artificial mineral waters have some advantages over natural waters. The supply of the latter exported from the springs of continental Europe is inadequate for the demand, and most natural waters lose materially by bottling. The springs too are subject to many changes, and frequently vary in the quantity or the relative proportion of their mineral ingredients. Artificial waters, on the contrary, are prepared according to analyses which represent the natural mineral waters when in their best condition. They are always the same in composition, in consequence of the technical perfection of their manufacture, and they produce the same general effect as the natural waters. They are more highly charged with carbonic acid gas than the latter, which insures their keeping in any climate and renders them more pleasant to the taste. The manufacture of mineral waters also embraces composition waters, devised for special medical purposes, and the beverages soda water, seltzer water, &c. The most important constituent of all these waters is carbonic acid gas, which is prepared by decomposing carbonates of lime and bicarbonates of soda with acids, especially sulphuric acid, in a vessel called the generator. Carbonates of lime contain from 41 to 52 per cent. of carbonic acid; bicarbonates of soda, 47-62 of soda and 52-38 of carbonic acid. Distilled water is used in making mineral waters, pure well or spring water for soda water, &c. Water absorbs nearly its own volume of carbonic acid gas at 60° F., and the absorption is increased by reduction of temperature, increase of pressure, or both. The principal substances or salts used in the manufacture of mineral waters are comprised in the following groups: 1, chlorides of magnesium, calcium, strontium, and lithium, carbonate of lime and of magnesia, and sulphate of magnesia; 2, the alkaline salts; 3, the salts of iron and of manganese. Waters containing sulphuretted hydrogen gas can never be perfectly imitated, because the formation of this gas is a continual process of decomposition, originating from the reaction of organic matter upon the sulphates. In the construction of the manufacturing apparatus two different systems are followed: 1. The Geneva system, an improvement of Struve's

original apparatus. In this the carbonic acid gas passes from the generator through purifying vessels or bottles containing partly water, partly certain solutions of salts, and thence into the gasometer, out of which it is pressed by a pump into the mixing cylinder, where the water is impregnated with it. Between the pump and the cylinder is placed the repurgator, a cylindrical tube of strong sheet copper containing fine charcoal, in which the gas undergoes a final purification. The water is then impregnated with the gas by revolving a paddling shaft which passes through the middle of the mixing cylinder. The latter is provided with a manometer which indicates the pressure of the gas, tubes through which the water enters, a safety valve, and a water gauge. Bramah's apparatus is of similar construction, but has some improvements. In it the water to be aerated and the expanded carbonic acid gas are pumped in the proper proportions into the receiving vessel, where they are mixed and the aëration completed. This system is more generally in use in England and France than in Germany. 2. The self-generator system, after which the apparatus of Ozouf, Gappard, and Savarès are constructed. It dispenses with the pump and gasometer, the water being impregnated by the pressure of the gas itself. The generator which contains the carbonates is filled with hot water to a certain height, and a square cooling apparatus is therefore applied between the washing vessels and the cylinder. This apparatus is not so expensive as the former, but is less recommended on account of the imperfect purification of the gas and its liability to explosion. The apparatus of Mr. John Matthews of New York, which is now widely introduced in Europe, is a combination of the Bramah and the self-generator systems, the mechanical devices of the former being greatly simplified, and the liability to explosion of the latter being obviated by a safety cap. This cap consists of a duplex disk, *a*, a nut, *b*, screwed firmly against it, a lead washer, *c*, to close joint on the generator bung, and an aperture, *d*, through which the gas escapes when the disk is ruptured by undue pressure.—After the mineral water is made, it is drawn from the apparatus into fountains (portable cylinders), siphons, or bottles, the faucets and filling and corking apparatus being so constructed as to prevent the loss of carbonic acid. For use, the fountains, which resemble the mixing cylinder in construction, are placed as reservoirs under or behind the marble case on the counter. The case contains ice in a cooling chamber, through which the connecting pipes



Matthews's Apparatus.

from the fountains pass to the faucets in front. The business of furnishing aerated waters in portable fountains has greatly increased since the improvements made by Matthews in the apparatus. The fountains previously in use were superficially coated with a wash of tin, and the contents were sooner or later contaminated by poisonous metallic salts. The Matthews fountains are composed of an inner container of pure sheet tin secured in a shell of fine cast steel. Although much lighter than the old style of fountains, the 15-gallon fountain weighing but 40 lbs., they will resist a pressure of 500 lbs. to the square inch; and the connections being made of solid tin encased in sustaining sheets, the water cannot be contaminated. There are now 10,000 of these fountains in use, furnishing 4,000 places for dispensing aerated waters. The most perfect and elegant dispensing apparatus, in which the sirups are contained in portable glass tanks where they do not come into contact with any metal, are now made in the United States and extensively exported to Europe. An important and novel improvement in bottling aerated beverages, an American invention, in which the bottle is closed from the inside by a glass stopper, has recently come into extensive use both in the United States and in Europe.—Soda water proper is a solution of carbonate of soda in water, impregnated with carbonic acid gas. Webb's English soda water contains 15 grains of crystallized carbonate of soda in one pint of water. Chloride of sodium is frequently added. Bicarbonate of soda is sometimes used for generating carbonic acid gas, and from this has arisen the popular use of the name soda water for carbonic acid water, or water charged with an excess of carbonic acid. German and American soda water, or what is called in France *eau de seltz*, contains no soda. Priestley first produced it by pouring dilute sulphuric acid over carbonate of lime, and impregnating the water with the gas; a method which is still generally followed. Under the name of soda, carbonic acid water is mixed with sirups, and it forms a constituent of many of the American compound drinks. In Paris it is taken as *eau gazeuse* with hock and clarets. Carbonic acid water improves the taste and increases the sanitary effect of drinks, is the best antidote for alcohol, and lessens the desire for spirituous liquors. It has a generally exhilarating and invigorating effect upon the system, essentially promotes digestion, checks too great acidity in the stomach, and is a much esteemed remedy in febrile diseases. Native wines are now extensively aerated in the United States, and American sparkling wines produced which will compare favorably with the best imported brands. This has been done only since the introduction of Matthews's apparatus, in which the receivers and all the parts that come into contact with the wine are lined with pure silver, a metal which does not affect it unfavorably. Mineral waters have

recently been brought from the most celebrated natural springs to New York in casks lined with pure tin sheets and aerated. Large quantities thus prepared are bottled or dispensed from fountains, and this trade is supplanting to a certain extent the manufacture of artificial mineral waters.—The great therapeutical value of baths in carbonic acid water (champane baths) is now established. They produce a pleasant burning sensation in the skin, give elasticity to the limbs, and are generally invigorating if used moderately. They are produced by adding to 10 or 15 gallons of water at 110° F. an equal quantity of very strong carbonic acid water from a highly charged fountain, the escaping gas being finely divided by means of an apparatus constructed for that purpose. Chloride of sodium and of magnesium are added for brine baths.—See Carl Schultz, "Review of the History of Mineral Waters" (New York, 1865).

MINERSVILLE, a borough of Schuylkill co., Pennsylvania, on the W. branch of the Schuylkill river and on the Mine Hill and Schuylkill Haven railroad, 4 m. W. of Pottsville, and 46 m. N. E. of Harrisburg; pop. in 1870, 3,699. It is surrounded by hills containing rich mines of anthracite, and has a national bank, a flour mill, saw mill, iron foundry, car factory, nine public schools, with a high school, a weekly newspaper, and four churches.

MINERVA, called by the Greeks **ATHENA**, **PALLAS**, or **PALLAS ATHENE**, in mythology, one of the principal Olympian divinities. She was one of the most ancient religious conceptions of the Greeks. Jupiter, after a victory over the Titans, chose for his first spouse the goddess Metis; but an oracle having declared that the son of Metis would snatch the supremacy away from his father, Jupiter swallowed both Metis and her unborn child. When the time of birth arrived, Jupiter felt a violent pain in his head, and in his agony requested Vulcan to cleave the head open with an axe; whereupon Minerva sprang forth, according to the later accounts, in full armor, and with a mighty war shout. She first took part in the discussions of the gods as an opponent of the savage Mars. She gave counsel to her father against the giants, and herself slew Pallas and Enceladus, the latter of whom she buried under Mt. Etna. She was the patron of heroism among men, and aided the Greeks in the Trojan war. As a protectress of the arts of peace, she appears as a maiden, in many respects resembling a princely daughter of the early heroic period. She bears in her hand the spool, the spindle, and the needle, and is said to have invented and excelled in every kind of work proper to women. The agriculturist and the mechanic were also under her care, and the philosopher, the orator, and the poet delighted in her protection. In all these employments she is the symbol of thought, the goddess of wisdom; and as such she was worshipped throughout Greece, and under the

name of Minerva she was adopted by the Romans. She was especially the national divinity of the Athenians, having in the reign of Cecrops contended with Neptune for the land, which she planted with the olive. On the Acropolis of Athens stood the magnificent temple of the Parthenon, dedicated to her, and containing her statue by Phidias; and the sacred festival of the Panathenæa was celebrated with great splendor in her honor. In the representations of art, as in the events of her life, she remains the goddess of pure reason, raised above every feminine weakness, and disdaining love. The helmet, buckler, lance, and ægis were her attributes; and the olive branch, serpent, and owl were sacred to her. In the ancient traditions she was represented as clothed usually in a sleeveless tunic, over which she threw a cloak, or folding peplus.

MINGHETTI, Marco, an Italian statesman, born in Bologna, Sept. 8, 1818. He early became known as a lecturer on political economy and advocate of free trade, and as a journalist. In 1848 he was for a short time minister of public works at Rome, but he left the service of Pius IX. to enlist in the Sardinian army, in which he rose to be major. He assisted Cavour at the congress of Paris in 1856, and published in 1859 *Della economia pubblica e delle sue attinenze con la morale e col diritto*. He was next secretary general in the ministry of foreign affairs, and subsequently, as a member and president of the assembly of the Romagna, he was active in the annexation of those provinces to the dominions of Victor Emanuel. Afterward he represented Bologna in the national parliament. Shortly before Cavour's death he became minister of the interior, and retained that office for a short time under Ricasoli. From 1863 to 1868 he was premier and minister of finance; and after being minister to England he accepted in 1869 the portfolio of agriculture, and in 1873 succeeded Lanza as prime minister. In the elections of November, 1874, he was once more returned to parliament. He has been long engaged upon a work on Europe before the reformation.

MINGRELIA, a district of Asiatic Russia, in the lieutenantancy of the Caucasus, forming part of the government of Kutais, bordering on the Circassian districts, Imerethia, Guria, the Black sea, and Abkhasia; area, about 2,600 sq. m.; pop. about 240,000, or, including Suanethi and Samurzakan (together 1,500 sq. m.), which are embraced in the same government, 280,000. The surface is generally mountainous, but slopes gradually to the south, particularly toward the Rion, its principal river. The climate is warm and damp, and fevers are prevalent. The soil is exceedingly fertile and vegetation rapid. The mountains are covered with magnificent forests, and much good land lies waste. The principal products are maize, wood, wax, and wool. Tobacco, rice, and millet are raised, and a good deal of silk, honey, and wine produced. There is an iron mine

and a smelting furnace, and in 1865 gold was discovered in the valley of the Ingur. The district is without internal improvement, and has a savage and deserted appearance. The inhabitants belong mainly to the Georgian race, but are generally inferior in appearance to the mountaineers of the Caucasus. The dominant religion is that of the Greek church.—Mingrelia nearly corresponds with the ancient Colchis. It was long a part of the kingdom of Georgia, was afterward independent under a line of native princes, and became subject to Russia in 1804; but its prince remained nominally sovereign till Jan. 17, 1867, when he ceded all his rights to the emperor of Russia in consideration of 1,000,000 rubles. On the W. coast the Russians have established the forts of Redut-Kaleh and Anaklia.

MINHO (Sp. *Minho*; anc. *Minius*), a river of Spain and Portugal, which rises in the Sierra de Mondoñedo, in the province of Lugo, Galicia, a short distance S. of Mondoñedo, flows first S. and then S. W., crosses the province of Orense, forms the boundary between the Spanish province of Pontevedra and the Portuguese province of Minho, and falls into the Atlantic near Caminha, about 30 m. S. of Vigo. It is about 150 m. long, and is navigable for only a short distance from its mouth, being obstructed by sand banks. It abounds in salmon and lampreys. Its principal tributaries are the Sil, which joins it on the left about 70 m. from its mouth, and the Avia on the right. The largest towns on its banks are Lugo and Orense in Spain.

MINHO, or *Entre Douro e Minho*, the northernmost province of Portugal, bounded N. by the Spanish province of Pontevedra, from which it is separated by the Minho, N. E. by that of Orense, E. by the Portuguese province of Tras os Montes, S. by Beira, from which it is separated by the Douro, and W. by the Atlantic; area, 2,807 sq. m.; pop. in 1871, 971,000. It is a high table land intersected by several mountain ridges, running in a N. E. and S. W. direction, one of which rises to the height of nearly 8,000 feet. The principal rivers are the Lima, Cavado, and Ave, which flow into the sea, and the Tamega, an affluent of the Douro; there are also numerous smaller rivers and streams, and the valleys are exceedingly fertile and well cultivated. The principal productions are wine, millet, oil, flax, cork, oranges, lemons, maize, wheat, barley, and oats. The well known wine called port from Oporto, whence it is shipped, is almost wholly made in this province. Numerous herds graze the pastures, and the province is famous for its pork. The sea and rivers abound with fish, the capture of which affords employment to many of the inhabitants. The principal manufactures are linen, hats, and cutlery. The population of this province is the most intelligent and prosperous portion of the Portuguese people. Capital, Braga.

MINIATURE PAINTING, a species of painting on a small scale, executed with water colors

on vellum, prepared paper, or ivory, or in enamel. The word originated from the ancient practice of writing the initial letters of manuscripts in *minium* or red lead, for the purpose of distinguishing the commencement of chapters or paragraphs. These rubrics, as they were called, gradually received many fanciful adornments at the hands of the illustrators, who added rich arabesque borders, and finally delicately executed little pictures illustrating the text, to which the general name of miniature was applied. The taste for this species of ornamentation existed at a period considerably anterior to the Christian era. The ancient Egyptians illuminated their papyri with colored hieroglyphics; and from passages in Pliny, Seneca, and other classical authors, the art seems to have been familiar to the Greeks and Romans. The middle ages, however, and especially the period extending from the 8th to the 14th century inclusive, witnessed its most perfect development; and the mediæval monks in the solitude of their convents found at once an amusement and a pious occupation in embellishing their missals, breviaries, and other sacred volumes. The illumination of missals was consequently for many ages the chief form in which miniature painting was practised, although, as in the case of fresco and oil paintings, subjects other than Scriptural or sacred were from the outset occasionally selected. The art seems from an early period to have been divided into two branches, the professors of the first being called *miniatori* or miniature painters, or illuminators of books; and those of the second *miniatori calligrafi*, or calligraphers. "To the first class," says Mrs. Merrifield, "belonged the task of painting Scripture stories, the borders, and the arabesques, and of laying on the gold and ornaments of the manuscripts. The second wrote the whole of the work, and those initial letters, generally drawn with blue or red, full of flourishes and fanciful ornaments, in which the patience of the writer is frequently more to be admired than his genius." Sometimes, however, the two branches were practised by the same person, and about the middle of the 14th century the execution of large illuminated initials adorned with various fanciful objects and figures, such as men, animals, birds, and flowers, became a distinct occupation, the ornamentation usually extending in scrolls along the upper and lower margins of the page. The pigments employed were of the purest quality, and were applied with an admixture of white in the shape of body colors, the vehicle being some glutinous substance sufficiently diluted in water to leave the surface of the vellum dull and lustreless. The Vatican collection of manuscripts contains one of the most ancient specimens of classical calligraphy extant, a Virgil of the 4th or 5th century with 50 miniatures, besides many others of a somewhat later date; and fragments of an illuminated Homer, which may also be ascribed to

the 4th or 5th century, are preserved in the Ambrosian library at Milan. The Byzantine artists particularly excelled as illuminators, and their manuscripts exhibit intricate arabesques of mixed foliage and animals, and the richest architectural fancies in the margins, although many of these are said to be repetitions of Romano-Christian works of the 5th and 6th centuries. The most elaborate exemplar of the school is the *Menologium*, or calendar executed about A. D. 1000 for the emperor Basil II., and which, notwithstanding one half of it is wanting, contains 430 miniatures on a gold ground, illustrating scenes from the lives of Christ and the saints, the history of the church, &c. The period extending from the middle of the 11th to the commencement of the 13th century was the richest in the history of the Byzantine school. Afterward the art rapidly deteriorated among them. Under the early Carolingian kings of France, the transcription and embellishment of manuscripts were greatly encouraged; and the Bibles of Charles the Bald, preserved in the imperial library at Paris, and in the Benedictine monastery of St. Calixtus in Rome, are admirably illustrated. The English manuscripts are not inferior to the continental, and the benedictional of St. Ethelwolf, executed in 963-'7 by Godeman, a monk of Hyde abbey, is considered one of the purest specimens of early English art. The celebrated Bedford missal, executed in France for John, duke of Bedford, regent of France under Henry VI., and now in the British museum, is one of the latest and richest specimens of the art of manuscript illumination. Among the most celebrated of the *miniatori*, who were also equally if not more celebrated in other branches of art, may be mentioned Simone Memmi, Giotto, Fra Angelico da Fiesole, Jan van Eyck, Squarcione, Girolamo dai Libri, Hans Memling, and Giulio Clovio. Memling was perhaps the best of all the illuminators; and of the industry of Giulio Clovio a memorable example is extant in his "Office of the Virgin," now in the royal library of Naples, the 28 miniatures of which are said to have occupied him nine years. With the invention of printing the occupation of the illuminator and calligrapher gradually ceased, although of late years the practice of embellishing books with illuminated borders and fanciful initials has again come into vogue. But modern invention has substituted for the toilsome efforts of the *miniatori* of the middle ages various rapid processes for printing designs in colors, of which Owen Jones's publications afford some happy illustrations.—The term miniature painting is now applied almost exclusively to small portraits executed on thin sheets of ivory, which, on account of the semi-transparency of its texture, is preferred to any other material. This property of the ivory renders it necessary for the back to be protected by something perfectly white, as the effect of the painting might be injured by any dark substance showing

through. Miniatures on ivory seldom exceed a few square inches in size. In England the art has been cultivated by an eminent line of artists from Holbein downward, embracing such names as Nicholas Hilliard, Isaac and Peter Oliver, Samuel Cooper, Hoskins, Flatman, Gibson, Cosway, Ross, Newton, Thorburn, &c., whose works are invaluable for the likenesses they afford of distinguished public characters. According to Dr. Waagen, "in no department have the English artists attained so high a state of perfection as in this." Under the first empire the French had many excellent miniaturists, including Isabeau, who not only painted on ivory portrait pieces containing many figures, but attempted with success historical subjects; Augustin, Guérin, Saint, Mme. de Mirbel, &c. The most eminent American miniature painter was Malbone, whose works are executed with great delicacy, and after the lapse of many years retain much of their original freshness. Of late years the introduction of colored or retouched photographic likenesses has somewhat interfered with the profession of the miniature painter; but these, owing to their perishable nature, can never wholly supplant portraits on ivory. Photography, regarded simply as an auxiliary to the miniature painter, rather aids than injures him by the data it affords for greater accuracy of drawing and proportions. (See ENAMELING.)—See "Original Treatises on the Arts of Painting in Oil, Miniature, Mosaic," &c., edited by Mrs. Merrifield (2 vols., London, 1849).

MINIÉ, Claude Etienne, a French inventor, born in Paris about 1805. At an early age he entered the army as a private soldier, and, after serving several campaigns in Algeria, reached the rank of captain. He now began to study improvements in firearms and projectiles; and on the supposition that he was from this cause losing his efficiency as a military officer, his dismissal was determined upon. Through the influence of the duke de Montpensier he was retained in the service, and gradually several of his improvements in rifle balls, cartridges, and gun barrels were adopted. In 1849 he was decorated with the cross of the legion of honor; in 1852 he was promoted to the rank of major on the retired list, and soon after was appointed *chef du tir*, or instructor in the use of firearms, at Vincennes. In 1853 he resigned this post, and was appointed by the Egyptian government to superintend a manufactory of arms and a school of gunnery at Cairo. The rifle bullet named after him is said to have been the invention of his friend and instructor, Capt. Delvigne. It consists of an elongated cylinder, conical in front and hollow behind, and fitted with a cap of thin iron, which, by filling the grooves of the barrel as the ball is forced through, gives to the latter a precision and range of flight previously unknown to gunnery. This was the first effectual introduction of the principle of expansion into the manufacture of firearms.

MINIUM. See LEAD, vol. x., p. 245.

MINK, a small, fur-bearing, carnivorous mammal, found in the northern parts of America, Europe, and Asia, belonging to the genus *putorius* (Cuv.), in which are included the ermine and common weasels, and to the sub-genus *lutreola* (Wagner). The minks have one molar less on each side above and below than the martens (*mustela*), and are therefore more carnivorous; the size is smaller, and the form more slender; the color is nearly uniform; the feet much webbed, and their pads large and naked, with the intervals not occupied by hairs. The common American mink (*P. vison*, Rich.) varies in length (from nose to base of tail) from 13 to 18 in., the tail being 8 to 10 in. additional; the general color is dark brownish, the tail nearly black, the chin white, but not the edge of the upper jaw; some specimens are lighter, even to yellowish brown; the head is broad and depressed, with truncated snout, short round ears, eyes small and far forward, long and rigid whiskers in four horizontal series; body long and vermiform, with long neck; short and stout limbs, with five-toed feet, armed with sharp claws; tail long and cylindrical, having on each side of the under surface a glandular cavity secreting a strong musky fluid, whence the generic name;



American Mink (*Putorius vison*).

mammæ six, ventral. The under fur is soft and downy, with larger and coarser hairs intermingled; the more southern the locality, the coarser and stiffer is the fur. The mink is an active, destructive depredator in the farm yard, sometimes killing several chickens in a single night, though less sanguinary than the weasel; it now and then catches a fish on its own account, and frequently steals those left by the angler; it feeds also on small rodents, marsh birds, frogs, and crawfish. It takes up its residence on the borders of ponds and small streams, especially near rapids and waterfalls; it is an excellent swimmer and diver, and a good runner; it rarely climbs trees, like the martens, unless hotly pursued; when killed in the water, it almost always sinks. It is readily caught in box or steel traps, or in dead-falls, baited with the head of a bird; it is very tenacious of life, and most active at night. In northern New York the breeding season begins toward the 1st of March, while the snow is on the ground; the young, five or six in number, are born about the end of April; when taken young, it is easily domesticated. The fur of the mink was formerly considered hardly worth collecting, a skin selling for

about 50 cents; but change of fashion afterward brought it into vogue and made it very valuable; it is fine, but shorter and less lustrous than that of the pine marten or American sable. (See *FUR*.) The animal is very generally distributed in North America, from lat. 70° N. to Florida, and from ocean to ocean. Some specimens from the west are larger than the average. In the northern states there is a smaller and blacker variety; the fur is dark and remarkably soft, and considerably more valuable than that of the common mink.—The European mink (*P. lutreola*, Cuv.) is of smaller size, darker colored, with less bushy tail, and the edges of the upper lip white; it is a rare animal, with the same habits as the American species, and its fur is more highly esteemed; indeed it is often sold to the inexperienced for sable, and that of the American mink is generally called by furriers American sable, though the latter belongs to the genus *mustela* and is properly a marten.

MINNEAPOLIS, a city and the county seat of Hennepin co., Minnesota, on both sides of the Mississippi river, here spanned by four bridges, at the falls of St. Anthony, 14 m. above St. Paul by the course of the stream, and 8 m. in a direct line W. N. W. of that city; pop. (within its present limits) in 1860, 5,822; in 1870, 18,079, of whom 6,013 were foreigners; in 1874, estimated by local authorities at 32,000. It is built on a broad natural esplanade overlooking the falls and the river, which is bordered at various points by picturesque bluffs. The surrounding country is remarkable for its beauty. Numerous lakes, particularly to the west, dot the landscape. The chief of these are Cedar, Calhoun, and Harriet, S. W. of the city. The celebrated Minnehaha falls, 3 m. below, attract large numbers of visitors. A cemetery association which was organized in 1871 has selected 128 acres between Lakes Calhoun and Harriet as the site for a cemetery. These grounds are covered with groves of young trees, and command fine views of the lakes. The city is regularly laid out, with avenues running E. and W. and streets crossing them N. and S. They are generally 80 ft. wide, with 20 ft. sidewalks, and two rows of trees on each side. There are many substantial business blocks and elegant residences. The court house, city hall, two principal hotels, academy of music, opera house, and Athenæum are noticeable structures. The city is supplied with water by powerful works, the streets are lighted with gas, and a system of sewerage is in process of construction. The Chicago, Milwaukee, and St. Paul railroad has its terminus here. The St. Paul and Pacific, and the Lake Superior and Mississippi railroads, with the Minneapolis and St. Louis line, connect the city with the Northern Pacific railroad, with Duluth, and with St. Paul and the diverging lines. A line of steamers in summer runs from above the falls to St. Cloud on the upper Mississippi.—The wholesale

trade of Minneapolis is important and constantly increasing. There are four large groceries, doing a business of from \$4,000,000 to \$5,000,000 a year, several hardware and iron houses, and three large dry-goods stores. The total commercial business in 1873 amounted to \$14,301,700; in 1871 it was \$10,530,000. There were five national banks and six private and savings banks in 1873, with an aggregate capital of \$1,025,000, and loans, discounts, and exchange to the amount of \$14,682,400. The amount of freight forwarded by rail in 1873 was 392,480,329 lbs.; received, 203,942,760 lbs.; being an increase over 1872 in receipts and shipments of 80,062,550 lbs. The falls of St. Anthony, having a perpendicular descent of 18 ft. and a total descent of 50 ft. within the space of a mile, afford abundant water power for manufacturing. The two principal items of manufacture are lumber and flour. There are 18 lumber mills, with an aggregate capital of \$1,110,000; hands employed in 1873, 2,062; feet of lumber manufactured, 189,909,782; shingles, 114,554,250; lath, 32,843,150; pickets, 546,373; total value of products, \$3,850,000. At the close of 1873 there were 18 flouring mills, with 150 run of stone and a daily capacity of 7,370 barrels, and others in course of erection which would increase the stone to 184 run and the capacity to 9,200 barrels a day. One of the mills, with 40 run of stone, is the largest in the country. The number of bushels of grain ground in 1873 was 3,545,000; barrels of flour produced, 646,000; pounds of feed, 57,050,000; total value of products, \$4,842,920. At the two grain elevators 1,687,423 bushels of wheat were handled in 1873. A third elevator, larger than either of the others, is in course of construction. There are extensive works for the manufacture of engines, boilers, water wheels, ploughs, harvesters, &c.; several manufactories of sash, doors, and blinds, four of furniture and desks, seven of barrels, seven of boots and shoes, five of saddlery and harness, two of bricks, two of soap, nine of carriages and wagons, one of linseed oil; several breweries, two paper mills, a cotton mill, and a woollen mill. There is also a pork-packing establishment, and the Chicago, Milwaukee, and St. Paul railroad has here extensive machine and repair shops. The number of hands employed in manufacturing in 1873 was 5,320; value of all products, \$15,879,680; amount of capital invested, \$16,000,000. The number of hands employed in 1867 was 1,841; value of products, \$4,460,358. The amount expended in the city in building and improvements in 1873 was \$1,729,700; taxable value of property, May 1, 1874, \$26,947,969.—Minneapolis is divided into ten wards, and is governed by a mayor and a board of aldermen of two members from each ward. It has a municipal court and an efficient police force and fire department. It is the seat of the state university, which occupies

large buildings on the E. side of the river. (See MINNESOTA, UNIVERSITY OF.) Augsburg theological seminary (Evangelical Lutheran) was organized in 1869 by Scandinavians. In 1873-'4 it had 5 professors and instructors, 63 students, and a library of 1,100 volumes. There are also an academy, a female seminary, and a business college. The Methodists are erecting (1875) a large edifice near the city for Hamline university, soon to be organized. The public schools embrace the various grades from primary to high school. There are ten school buildings of brick and stone. The number of departments in 1873 was 35; teachers, 37; pupils enrolled, 2,298; average attendance, 1,866. The Athenæum library contains 4,000 volumes. There are two daily and nine weekly (two Norwegian and one German) newspapers, and two semi-monthly (one Norwegian) periodicals. The number of churches is 48, viz.: 5 Baptist (1 African and 1 Swedish), 1 Christian, 5 Congregational, 4 Episcopal (besides 2 missions), 1 Freewill Baptist, 1 Friends', 7 Lutheran (3 German Evangelical, 3 Norwegian, and 1 Swedish Evangelical), 1 Methodist (1 African, 2 German, and 1 Scandinavian), 4 Presbyterian, 4 Roman Catholic, 1 Swedenborgian, 1 Unitarian, and 3 Universalist.—Minneapolis was first settled in 1849, and originally embraced only that portion of the city on the W. bank of the Mississippi. It was incorporated in 1867, and in 1872 the city of St. Anthony on the E. bank of the river (incorporated in 1856) was consolidated with it.

MINNEHAHA, a S. E. county of Dakota, bordering on Minnesota and Iowa, and drained by the Big Sioux river; area, 816 sq. m.; pop. in 1870, 355. The surface is elevated, and the soil productive. Capital, Sioux Falls.

MINNESINGERS (Ger. *Minne*, love, and *Sänger*, singer), a school of German poets which sprang into existence in the latter half of the 12th century, and flourished until near the close of the 13th. Their themes were amatory and heroic, and were treated in much the same manner as those of the troubadours of Provence, though in a more earnest spirit and after a purer ideal conception of love. (See GERMANY, LITERATURE OF, vol. vii., p. 763.)

MINNESOTA, one of the northwestern states of the American Union, the 19th admitted, and the 28th in rank according to population, situated between lat. 43° 30' and 49° 24' N., and lon. 89° 39' and 97° 5' W.; extreme length N. and S., 380 m.; breadth from 183 m. in the middle to 262 m. on the S. line and 337 m. near the N. line; area, 83,531 sq. m. It is bounded N. by British America, the dividing line being formed W. of the lake of the Woods by the 49th parallel, and E. of that lake by Rainy Lake river, Rainy and other lakes, and Pigeon river; E. by Lake Superior and Wisconsin, from which it is separated by a line drawn due S. from the first rapids in the St. Louis river to the St. Croix river, and by the St. Croix and Mississippi rivers; S. by Iowa; and W. by Dakota, from which it

is divided by the Red river of the North, the Bois des Sioux river, Lake Traverse and Big Stone lake, and a line drawn directly S. from the outlet of the last named lake to the Iowa



State Seal of Minnesota.

boundary. The state is divided into 76 counties, viz.: Aitken, Anoka, Becker, Beltrami, Benton, Big Stone, Blue Earth, Brown, Carlton, Carver, Cass, Chippewa, Chisago, Clay, Cook, Cottonwood, Crow Wing, Dakota, Dodge, Douglas, Faribault, Fillmore, Freeborn, Goodhue, Grant, Hennepin, Houston, Isanti, Itasca, Jackson, Kanabec, Kandiyohi, Lac qui Parle, Lake, Le Sueur, Lincoln, Lyon, McLeod, Martin, Meeker, Mille Lacs, Morrison, Mower, Murray, Nicollet, Nobles, Olmsted, Otter Tail, Pembina, Pine, Polk, Pope, Ramsey, Redwood, Renville, Rice, Rock, St. Louis, Scott, Sherburne, Sibley, Stearns, Steele, Stevens, Swift, Todd, Traverse, Wabashaw, Wadena, Waseca, Washington, Watonwan, Wilkin, Winona, Wright, Yellow Medicine. St. Paul, the capital, near the E. border of the state, 400 m. N. W. of Chicago, had 20,030 inhabitants in 1870. The other cities, according to the census of 1870, were: Duluth, 3,131 inhabitants; Hastings, 3,458; Mankato, 3,482; Minneapolis, 13,066; Owatonna, 2,070; Red Wing, 4,260; Rochester, 3,953; St. Anthony, 5,013; St. Cloud, 2,161; and Winona, 7,192. Since the census St. Anthony has been annexed to Minneapolis.—The population of Minnesota was 6,077 in 1850, 172,023 in 1860, 250,099 (state census) in 1865, and 439,706 in 1870, including 438,257 white, 759 colored, and 690 Indians. The calculated population on June 1, 1873, was 552,459. Of the total population in 1870, 235,299 were males and 204,407 females, and 279,009 were of native and 160,697 of foreign birth. Of the natives, 125,491 were born in the state, 10,979 in Illinois, 9,939 in Maine, 39,507 in New York, 12,651 in Ohio, 11,966 in Pennsylvania, and 24,048 in Wisconsin. The foreign population comprised 16,698 born in British America, 1,910 in Denmark, 1,743 in France, 41,364 in Germany, 5,670 in England, 21,748 in Ireland, 2,194 in Scotland,

1,855 in Holland, 35,940 in Norway, 20,987 in Sweden, and 2,162 in Switzerland. The density of population was 5·26 to a square mile. There were 82,471 families with an average of 5·33 persons to each, and 81,140 dwellings with an average of 5·42 persons to each. The increase of population from 1860 to 1870 was 155·61 per cent., being a greater percentage of increase than that of any other state except Kansas. The number of male citizens 21 years old and upward was 75,274; of persons from 5 to 18 years of age, 142,665; attending school, 96,793. There were 12,747 persons 10 years of age and upward unable to read, and 24,413 unable to write; of the latter, 5,558 were of native and 18,855 of foreign birth; illiterates, 7·99 per cent. of the population 10 years old and over; number of illiterates 21 years of age and upward, 18,484, of whom 8,195 were males and 10,289 females. The number of paupers supported during the year ending June 1, 1870, was 684, at a cost of \$66,167. Of the total number (392) receiving support June 1, 1870, 126 were natives and 266 foreigners. The number of persons convicted of crime during the year was 214; in prison at the end of the year, 129, including 73 natives and 56 foreigners. The state contained 103 blind, 166 deaf and dumb, 302 insane, and 134 idiotic. Of the total population 10 years old and over (305,568), there were engaged in all occupations 132,657; in agriculture, 75,157, including 20,277 laborers and 54,623 farmers and planters; in professional and personal services, 28,330, of whom 620 were clergymen, 8,556 domestic servants, 13,037 laborers not specified, 449 lawyers, 402 physicians and surgeons, and 1,754 teachers not specified; in trade and transportation, 10,582; and in manufactures and mechanical and mining industries, 18,588. The total number of deaths from all causes was 3,526, being 0·802 per cent. of the population. There were 459 deaths from consumption, being 7·7 deaths from all causes to 1 from that disease; 177 from pneumonia, 19·9 from all causes to 1 from that disease; 112 from diarrhoea, 108 from cholera infantum, and 103 from whooping cough. The number of deaths reported by the state authorities in 1872 was 5,228, or 1·035 per cent. of the population. Of the whole number of deaths, 36·07 per cent. were from zymotic diseases, 13·50 constitutional, 18·61 local, 10·04 developmental, 4·72 violent deaths, and 17·04 unknown. The excess of births over deaths was 9,734. At the beginning of 1875 there were 5,973 Indians reported in Minnesota, who were settled on reservations in the central and northern parts of the state. They consisted of seven bands of Chippewas, with three agencies at White Earth, Leech lake, and Red lake. These Indians have schools and are for the most part occupied in agriculture.—Lying nearly at the centre of the continent and occupying the most elevated plateau between the gulf of Mexico and Hudson bay, Minnesota forms the water-

shed of the three great river systems of North America: that of the Mississippi, which flows S. to the gulf of Mexico; that of the St. Lawrence, which, connected with the chain of northern lakes, has an easterly direction to the Atlantic ocean; and that of the Red river of the North, flowing N. to Winnepeg lake, which has its outlet in Hudson bay. A group of low sandhills in the N. E. part of the state, formed by huge deposits of drift overlying a local outcrop of the primary and metamorphic rocks, and called *Hauteurs des Terres*, forms the dividing ridge between the Mississippi and Lake Superior. The Heights of Land rise by scarcely perceptible slopes from the general level, in no instance higher than 1,680 ft. above the sea, which is not more than 600 ft. above the average elevation of the country. These hills are commonly flat at the top, varying in height from 85 to 100 ft. above the surrounding waters. The principal group of these drift hills is subdivided into several ramifications. A prominent spur extends southerly from the Itasca crest of the Mississippi for perhaps 150 m., known as the Leaf mountains and the Coteau du Grand Bois of Nicolet, and forms a low dividing ridge between the waters of the Mississippi and Red rivers. The crest of the dividing ridge between Lake Superior and the Mississippi is not more than 1,400 ft. high; and the highest of the trap summits north of the lake is but 1,475 ft. Generally the surface of Minnesota is an undulating plain, with an average elevation of nearly 1,000 ft. above the sea, and presents a succession of small rolling prairies or table lands, studded with lakes and groves, and alternating with belts of timber. Two thirds of the surface slopes S. E. with the waters of the Mississippi, the northern part of the state being nearly equally divided between the alluvial levels of the Red river valley on the northwest and the broken highlands of the northeast, which are mainly drained by the precipitous streams which flow into Lake Superior and the Rainy lake chain.—The Mississippi river rises in Lake Itasca in the extreme western elbow of the Heights of Land, and flows S. E., 797 m. of its course belonging to Minnesota, of which 134 forms the E. boundary; it is navigable about 540 m. within the state. The Minnesota traverses the lower part of the state in a S. E. and N. E. direction, and after a course through the state of 450 m. falls into the Mississippi at Fort Snelling, 5 m. above St. Paul; it is navigable about 300 m. The Red river of the North rises in Elbow lake, flows through several lakes, running in a S. W. direction, and then turning N. forms the W. boundary for 379 m.; it is navigable about 250 m. The St. Croix rises in Wisconsin, forms 129 m. of the E. boundary, and falls into the Mississippi; it is navigable for 53 m. In the N. E. part is the St. Louis river, which falls into Lake Superior, and is important as the first link in the chain of lakes and rivers of the St. Lawrence system; and in the S. W. are the head

waters of the Des Moines, about 135 m. long, of which about 20 are navigable. All the rivers have numerous branches, which are not navigable. The navigable waters within the state have a total shore line of 2,746 m., and a water line of 1,532 m. Along the banks of the Mississippi and of some other rivers are high bluffs, forming one of the most interesting and characteristic features of the scenery. Minnesota is distinguished for the number and beauty of its lakes. They have been estimated as high as 10,000 in number, and are from 1 m. to 30 m. in diameter; and many of them have an area of from 100 to 400 sq. m. Their waters, generally sweet and clear, abound in fish. The largest are the lake of the Woods, Rainy, Namekin, Bois Blanc, Vermilion, Swan, Sandy, Winibigoshish, and Leech lakes, and Mille lacs in the north and northeast, Red lake in the northwest, Big Stone, Benton, Sauk, and Swan in the west and southwest.—Notwithstanding the great area covered by this state, its rock formations, so far as they have been explored, appear to be limited almost exclusively to the azoic and lower protozoic groups; and over the greater part of the state these are concealed beneath the diluvial deposits which make the superficial covering of the rolling prairies. The N. W. coast of Lake Superior is made up of metamorphic slates and sandstones, intermingled with grits of volcanic origin and other bedded traps and porphyries. These are intersected by frequent dikes of greenstone and basalt; and among them are occasional deposits of red clay, marl, and drift. Behind this group are traced westward, along the northern boundary of the state, formations of hornblende and argillaceous slates, succeeded by granitic and other metamorphic rocks. These groups extend S. W. into the central portions of the state. Along the southern boundary the Devonian formation is found in the extreme west; the Niagara limestone succeeds this toward the east, and next occurs the Galena limestone, and then the Trenton limestone and the upper or St. Peter's sandstone, which overlies the Potsdam sandstone. These sandstones crop out up the valley of the Mississippi, nearly as far as Fort Snelling, where the lower Silurian limestones, which on both sides of the river lie behind and over the sandstones, meet in the valley and form the bluffs of the rivers. They are traced up the Minnesota river, curving round and almost reaching the southern boundary of the state again, and cutting off the continuation of the higher groups further northward. Thus throughout the state there appears to be no room for the carboniferous group. The lead-bearing rocks traced from the Iowa line are limited and of little importance. It is believed that the N. E. corner of the state will prove a valuable mineral field. Copper abounds in the mineral belt stretching along the N. shore of Lake Superior, and masses of the pure metal have been taken from Knife and Stuart rivers. Iron ore of good quality is found in

considerable quantities around Portage and Pigeon rivers. Large deposits of peat exist in all parts of the state. In the Red river valley are extensive salt springs. Slate, limestone, sand for glass, and clay are also found. The existence of gold and silver on the shores of Vermilion lake has been shown. A geological and natural history survey of Minnesota is now (1875) in progress, under the direction of N. H. Winchell, state geologist, and S. F. Peckham, state chemist, professors in the state university, to which institution the survey has been intrusted by law. Up to 1875 a preliminary report and two reports of progress had been printed in the annual reports of the board of regents for 1873-'5.—The soil is fertile, two thirds of the surface being well adapted to the cultivation of all the cereals and roots of the temperate zone. It is composed generally of a dark, calcareous loam, abounding in organic and saline ingredients, and is retentive of moisture. The climate of Minnesota is pleasant. The winters are cold, but clear and dry, and the fall of snow is light; the summers are warm, with breezy nights, during which occur most of the rains; and the general purity of the air and salubrity of its climate recommend it for the residence of invalids. The following summary for 1874, reported by the United States signal bureau, is for St. Paul, lat. 44° 53', lon. 93° 5':

MONTH.	THERMOMETER.			Mean barometer.	Total rainfall, inches.	Prevailing wind.
	Maxim.	Minim.	Mean.			
January....	43-00	-23-00	13-55	30-073	0-49	Southeast.
February....	36-00	-18-00	14-40	30-082	1-07	Southeast.
March....	46-00	-5-00	23-66	30-080	2-24	Northwest.
April.....	71-00	7-00	37-52	30-008	0-95	North.
May.....	94-00	31-00	62-24	29-860	1-65	North.
June.....	94-00	42-00	68-70	29-797	11-67	Southeast.
July.....	99-00	53-00	74-72	29-842	1-94	Southeast.
August....	91-00	54-00	70-54	29-892	8-90	Southeast.
September	92-00	37-00	60-95	29-908	5-76	Southeast.
October..	74-00	21-00	49-36	30-003	3-21	Northwest.
November	72-00	-8-00	33-72	29-951	1-90	Southeast.
December.	48-00	-20-00	18-81	30-543	0-72	Northwest.
Mean....	71-67	14-25	43-82	30-490	85-50	Southeast.

The country, especially above lat. 46°, is well timbered; pine forests extend far to the north, and birch, maple, aspen, ash, and elm abound. A large forest of hard-wood varieties, known as the Big Woods, and called Bois Franc by the early French settlers, extends over the central portion of the state W. of the Mississippi, and covers an area of about 4,000 sq. m. On the river bottoms are found basswood, elm, aspen, butternut, ash, birch, maple, linden, balsam fir, and some oaks; and in the swamps tamarack, cedar, and cypress. Among the wild animals are the elk, deer, antelope, bear, wolverene, otter, muskrat, mink, marten, raccoon, and wolf. Of birds, there are the golden and bald eagles, grouse, partridge, hawk, buzzard, owl, quail, plover, lark, and many smaller kinds. There are also the pelican, tern, shelldrake, teal, loon, wild geese, wild ducks, and other water fowl. The waters contain pike,

pickerel, bass, whitefish, muskelonge, catfish, trout, and other varieties of fish.—Many natural objects of interest are found in the state. The Mississippi, studded with islands and bordered by high bluffs, presents a succession of picturesque scenes. Mountain island, with an elevation of 428 ft., Maiden's rock, celebrated in Indian tradition, on an expansion of the river called Lake Pepin, about 400 ft. high, and La Grange mountain on the same lake, are all notable. St. Anthony's falls, celebrated as much for their surrounding scenery as for the descent of the waters, which have a perpendicular fall of only 18 ft., are further up the river. A few miles beyond, between Minneapolis and Fort Snelling, are the Minnehaha falls, a romantic and beautiful cascade with a perpendicular pitch of 45 ft., flowing over a projecting rock which permits a passage underneath. Brown's falls, which have a perpendicular descent of 50 ft., and including the rapids of 100 ft., are W. of the Mississippi, on a narrow stream which is the outlet of several small lakes. There are also falls or rapids on the St. Croix, about half a mile below which is a noted pass through which the river has forced its way, called the Dalles of St. Croix, and others of less note on various streams. About 2 m. from St. Paul is Fountain cave, an excavation in the white sandstone, with an entrance about 15 ft. in diameter opening into a chamber 150 ft. long and 20 ft. wide. The cave has been explored for 1,000 ft., without the termination being reached.—Minnesota has made the most rapid progress in agriculture during the past few years. The most prominent staple is wheat, for the production of which the soil and climate are most favorable. Of the reported cultivated acreage in 1872, wheat occupied 61.14 per cent., the average yield per acre being 17.4 bushels; in 1873 the percentage of acreage had increased to 63.53. Next to wheat the most important crops are oats and corn, the percentage of acreage in 1872 being 17.97 of the former and 10.44 of the latter. The soil and climate are also highly favorable to wool growing. In 1860 Minnesota had 2,711,968 acres of land in farms, of which only 556,250 acres were improved, there being 18,181 farms with an average of 149 acres each. In 1870 there were 46,500 farms of an average of 139 acres each, the total acreage of farm lands being 2,322,102 improved and 4,161,726 unimproved, including 1,336,299 of woodland, the percentage of improved land to total in farms being 64.2. Of the total number of farms in 1870, 4,030 contained from 3 to 10 acres, 7,948 from 10 to 20, 18,099 from 20 to 50, 11,078 from 50 to 100, 5,039 from 100 to 500, 128 from 500 to 1,000, and 2 over 1,000. The cash value of farms was \$97,847,422; of farming implements and machinery, \$6,721,120; total amount of wages paid during the year, including the value of board, \$4,459,201; total (estimated) value of all farm productions, including betterments and additions

to stock, \$33,446,400; orchard products, \$15,818; produce of market gardens, \$115,234; forest products, \$311,528; home manufactures, \$174,046; animals slaughtered or sold for slaughter, \$3,076,650; all live stock, \$20,118,841. The productions were 18,789,188 bushels of spring and 76,885 of winter wheat, 78,088 of rye, 4,743,117 of Indian corn, 10,678,261 of oats, 1,032,024 of barley, 52,438 of buckwheat, 46,601 of peas and beans, 1,943,063 of Irish and 1,594 of sweet potatoes, 3,045 of grass and 18,635 of flax seed, 695,053 tons of hay, 8,247 lbs. of tobacco, 401,185 of wool, 9,522,010 of butter, 233,977 of cheese, 222,065 of hops, 122,571 of flax, 210,467 of maple sugar, 92,606 of honey, 1,750 gallons of wine, 208,130 of milk sold, 38,735 of sorghum and 12,722 of maple molasses. Besides 9,667 horses and 54,862 neat cattle not on farms, there were 93,011 horses, 2,350 mules and asses, 121,467 milch cows, 43,176 working oxen, 145,736 other cattle, 132,343 sheep, and 148,473 swine. The agricultural statistics for 1872 were reported as follows by the state authorities:

PRODUCTS.	No. of acres planted.	Amount produced.	Average yield per acre.
Wheat, bushels.....	1,267,809	22,059,375	17.40
Oats, ".....	872,478	12,550,738	83.69
Corn, ".....	216,455	7,142,245	82.99
Barley, ".....	56,755	1,495,495	26.83
Rye, ".....	11,865	182,730	16.07
Buckwheat, ".....	8,601	49,859	18.70
Beans, ".....	1,482	19,156	12.92
Flax, pounds of fibre.....	12,161	2,908,079	.....
" bushels of seed.....		71,752	.....
Potatoes, bushels.....	26,061	8,072,349	117.59
Sorghum, gallons of sirup...	859	78,095	.....
Hops, pounds.....	88	114,429	.....
Hay, cultivated, tons.....	88,990	108,023	1.21
" wild, tons.....		7,414	.....
Maple sugar, pounds.....		195,557	.....
" sirup, gallons.....		17,394	.....
Honey, No. of hives of bees.....		18,704	.....
" pounds.....		232,948	.....
Tobacco, pounds.....		42,788	.....
Timothy seed, bushels.....		15,228	.....
Clover ".....		2,848	.....
Apple trees, growing.....		1,734,861	.....
" in bearing.....		87,451	.....
Apples, bushels raised.....		83,663	.....
Strawberries, quarts.....		277,716	.....
Wool, sheep sheared.....		125,723	.....
" pounds.....		497,045	.....
Butter, ".....		8,323,680	.....
Cheese, ".....		772,680	.....
Cows, milked.....		135,691	.....

In 1873 the number of acres under cultivation had increased to 2,332,672, of which 2,166,598 were sown with grain; number of farms, 58,973; there were 141,871 horses, 419,084 cattle, 4,005 mules and asses, 149,206 sheep, and 149,896 hogs.—As yet Minnesota does not hold a high rank as a manufacturing state, the people being more extensively engaged in agriculture. It has, however, a most important element for great industrial prosperity in the abundant water power afforded by its numerous streams. It has been estimated that about 100,000 horse power could be utilized during the day time throughout nearly the entire year, at the falls of St. Anthony; while the

St. Croix falls are only second to them in hydraulic power. The total number of manufacturing establishments reported by the census of 1870 was 2,270, having 246 steam engines of 7,085 horse power and 434 water wheels of 13,054 horse power, and employing 11,290 hands, of whom 10,892 were males above 16, 259 females above 15, and 139 youth. The capital invested amounted to \$11,993,729; wages, \$4,052,837; value of materials, \$13,842,902; of products, \$23,110,700. The most important industries are represented in the following statement:

INDUSTRIES.	No. of establishments.	Number of hands.	Capital.	Value of products.
Blacksmithing.....	310	630	\$255,511	\$628,923
Boots and shoes.....	172	526	228,569	653,165
Carpenter's and building	223	676	104,860	1,067,203
Carriages and wagons...	102	444	858,168	549,568
Cars, freight and passenger.....	1	79	170,000	788,800
Cooperage.....	62	338	126,020	457,888
Orist mill products.....	216	790	2,900,015	7,384,375
Furniture.....	85	398	902,550	448,772
Liquors, malt.....	65	225	450,550	388,555
Lumber, planed.....	13	53	143,400	239,642
" sawed.....	207	2,952	3,311,140	4,299,162
Machinery, railroad repairing.....	4	456	253,021	788,074
Machinery, steam engines and boilers.....	8	233	220,000	886,462
Printing and publishing, newspaper.....	20	241	267,000	843,304
Saddlery and harness...	93	269	165,475	354,259
Sash, doors, and blinds..	27	254	263,133	357,616
Tin, copper, and sheet-iron ware.....	73	231	161,685	848,696

The vast pine forests of Minnesota constitute an important source of wealth. It is estimated that about one third of the state is timbered land. On the head waters of the various tributaries of the extreme upper Mississippi and St. Croix rivers is an extensive "pine region," comprising an estimated area of 21,000 square miles. Vast pine forests are also found on the shore of Lake Superior, and on the Red river and its tributaries. The cutting and sawing of logs affords extensive employment for men and capital. In 1873, 164,743,150 ft. of logs were reported to have been scaled in the North Mississippi district, including 161,880,670 ft. at Minneapolis, while 33,000,000 ft. were estimated to have been sawed but not scaled. The total number of feet scaled in the St. Croix district was 147,618,147; sawed and not scaled, 8,338,976; sawed and scaled, 94,229. In the Duluth district the number of feet scaled amounted to 6,147,988. In the St. Croix district the manufactured lumber was reported at 74,063,976 ft., besides 19,200,000 shingles and 19,477,850 lath.—Minnesota has unusual commercial advantages, having within its limits three great navigable water systems, which are connected with the railroad system of the state, and afford continuous channels of communication with Hudson bay, the Atlantic ocean, and the gulf of Mexico. The Mississippi is navigable to St. Paul about 225 days in the year. The completion of the Northern Pacific railroad, which

has its E. terminus at Duluth, on Lake Superior, and is now (1875) in operation to Bismarck in Dakota, 450 m., will give the state direct communication with the Pacific. This road, which joins the lake and the Red river water systems, is to be connected with the other railroads of Minnesota and the Mississippi river by three lines of railroad at the eastern, central, and western portions of the state. The Lake Superior and Mississippi railroad joins St. Paul, at the head of navigation on the Mississippi river, and Duluth, at the head of Lake Superior; while the former city will have direct connection with the Northern Pacific railroad by the two divisions of the St. Paul and Pacific, which are now in process of construction, one extending from St. Anthony to Brainerd, and the other from St. Cloud to St. Vincent, on the N. W. border of the state, a distance of 315 m., crossing the Northern Pacific at Glyndon, 13 m. E. of the Red river. This road is now in operation from St. Cloud to Melrose, 35 m. From St. Vincent it is to be continued to Fort Garry in the province of Manitoba, 61 m. from the Minnesota border. The state also has connection with the Union Pacific railroad by means of the St. Paul and Sioux City and Sioux City and St. Paul railroads. Furthermore, the completion of the contemplated improvements in the Fox and Wisconsin rivers will give to Minnesota a continuous water channel from the Mississippi river to Lake Michigan. The commercial importance of Minnesota will be seen from the fact that the entire trade of its great water systems, and much of that of its railroads, will here break bulk. The state comprises the United States customs district of Duluth and that of Minnesota, of which the port of entry is Pembina on the Red river, at the northern border of the state; and St. Paul is a port of delivery. The imports at Duluth during the year ending June 30, 1874, amounted to \$12,129, and the domestic exports to \$13,819. In the Minnesota district the imports were \$182,054; domestic exports, \$690,066; foreign exports, \$2,521. The chief articles of export were oats, flour, and lumber. The number and tonnage of vessels that entered and cleared in the foreign trade, together with those registered, enrolled, and licensed, were as follows:

DISTRICTS.	ENTERED.		CLEARED.		REGISTERED, &c.	
	No.	Tons.	No.	Tons.	No.	Tons.
Duluth.....	55	19,166	53	19,240	7	1,882
Minnesota.....	40	4,410	40	4,408	93	5,045
Total.....	95	23,576	93	23,648	100	9,880

Of those enrolled in the Minnesota district, 54 were steamers and 39 unrigged vessels; and of those in the Duluth district, 6 of 1,282 tons were steamers. Besides the above, 259 vessels of 153,792 tons entered at Duluth in the coastwise trade, and 264 of 154,292

tons cleared. In 1873 5 steam vessels of 510 tons and 4 barges were built in the Minnesota district.—Since 1857, when congress made to Minnesota a grant of six sections per mile of the public lands to aid in the construction of railroads, which was increased to ten sections per mile in 1865, not less than 13,200,000 acres of land, or more than one fourth of the entire area of the state, has been granted to railroad corporations, either by the general government or the state. These grants comprise 11,250,000 acres by congress and 1,950,000 by the state; and 5,515,007 acres have already been conveyed to the companies. The railroad companies in the state organized under special charters are required to pay to the state, in lieu of all other taxes, 1 per cent. of their gross earnings for the first three years, 2 per cent. during the next seven years, and 3 per cent. thereafter. Other railroad companies can acquire the same privileges by com-

plying with the provisions of the law. The gross earnings of the companies subject to this law in 1872 were reported at \$5,399,578, on which the tax amounted to \$106,876. The gross earnings during the year ending Sept. 1, 1873, were \$5,536,104, including \$1,385,272 from passengers and \$3,811,603 from freight. The total expenses of all the companies amounted to \$4,140,885. A commissioner is appointed by the state, whose duty is to report to the legislature annually concerning the finances, business, and general condition of every railroad company in the state. Minnesota had 31 m. of railroad in 1863, 298 in 1866, and 1,092 in 1870. In 1874 there were 1,833 m. of main track and branches, exclusive of side track, &c. The railroads completed in the state, and their termini, in 1874, with the capital stock issued, the latter items being reported by the state commissioner for the year ending Sept. 1, 1873, are as follows:

NAME OF CORPORATION.	TERMINI.	Miles com- pleted in the state in 1874.	Total length between termi- ni when different from the preceding.	Capital stock authorized, reported by state commissioners, Sept. 1, 1873.	Acres of land granted by congress.
Chicago, Dubuque, and Minnesota....	Dubuque, Ia., to La Crescent.....	24	118	\$426,215	.....
Chicago, Milwaukee, and St. Paul....	" " " "	120	824	8,152,000	.....
Via La Crosse.....	Milwaukee, Wis., to St. Paul.....	127	405	.....	.....
" Prairie du Chien.....	" " " "	9	.....	.....	.....
Branches.....	Mendota to Minneapolis.....	10	40	.....	.....
Leased (Hastings and Dakota).....	Mason City, Ia., to Austin.....	75	.....	750,000	500,000
Lake Superior and Mississippi.....	Hastings to Glencoe.....	156	.....	5,125,000	480,854
(Stillwater and St. Paul.....)	St. Paul to Duluth.....	13	.....	400,000	.....
Leased.....	White Bear to Stillwater.....	14	.....	200,000	.....
(Minneapolis and Duluth.....)	White Bear to Minneapolis.....	28	.....	92,000	.....
(Minneapolis and St. Louis.....)	Minneapolis to Sioux City Junction.....	254	1,500	18,289,300	2,918,400
Northern Pacific.....	Duluth to Puget Sound.....	217	.....	500,000	1,248,688
St. Paul and Pacific.....	St. Paul to Breckenridge.....	75	125	1,468,600	940,000
Branch.....	St. Anthony to Brainerd.....	85	815	.....	2,000,000
St. Vincent extension.....	St. Cloud to St. Vincent.....	122	.....	1,851,500	850,000
St. Paul and Sioux City.....	St. Paul to St. James.....	18	.....	277,500	.....
St. Paul, Stillwater, and Taylor's Falls	Near St. Paul to Stillwater.....	66	148	1,515,780	.....
Sioux City and St. Paul.....	Sioux City, Ia., to St. James.....	168	.....	8,825,000	450,000
Southern Minnesota.....	Grand Crossing to Winnebago.....	4	197	.....	.....
West Wisconsin.....	St. Paul to Elroy, Wis.....	288	826	400,000	710,000
Winona and St. Peter.....	Winona to Lake Kampeska, Dak.....	1,888	.....	.....	.....

—There were 32 national banks in operation in Minnesota, Nov. 1, 1874, with a paid-in capital of \$4,448,700; total amount of circulation issued, \$4,455,000; amount outstanding at that date, \$3,393,501, the latter being \$7 71 per capita. The ratio of circulation to the wealth of the state was 1·5 per cent.; to bank capital, 76·3 per cent. There were five savings banks, with deposits aggregating \$843,498. The total number of fire and marine insurance companies transacting business in the state in 1873 was 45, including 2 Minnesota and 36 other American and 7 foreign companies. The number of life insurance companies was 35, of which only one was organized under the laws of the state.—The present constitution of Minnesota was adopted Oct. 13, 1857, and the government organized May 22, 1858. The qualifications for voters are, that they be males, 21 years of age, who are or have declared their intention of becoming citizens of

the United States, and who have resided in the United States one year, and in the state four months next preceding. Indians and persons of mixed white and Indian blood who have adopted the language, customs, and habits of civilization, are also allowed to vote in any district in which they have resided for the ten days next preceding. The legislature consists of 41 senators elected for two years, and 106 representatives elected for one year. They must be qualified voters and residents in the state one year, and in their respective districts six months next before the election. The election is held on the Tuesday after the first Monday in November of each year, and the legislature meets on the Tuesday after the first Monday in January. Its sessions are limited to 60 days. The executive department consists of a governor (salary \$5,000), lieutenant governor, secretary of state (\$1,800), treasurer (\$3,500), attorney general (\$1,000), all

elected for two years, and an auditor (\$2,500), elected for three years. The judiciary comprises a supreme court consisting of a chief and two associate justices (salary \$3,000), nine district courts, and a probate court in each county, besides justices of the peace, who have jurisdiction where the amount in dispute does not exceed \$100, and where the title to real estate is not involved. All judges are elected by the people, those of the supreme and district courts for seven years and the others for two years. The supreme court has power to issue all remedial writs, and appellate jurisdiction of judgments and orders of the district courts. The latter have original jurisdiction of all civil actions within their respective districts when the sum in controversy exceeds \$100, all civil actions not within the jurisdiction of justices of the peace, and in equity; also appellate jurisdiction from courts of probate and justices of the peace. Besides the above named state officers, there is a commissioner of railroads and a commissioner of insurance. In 1872 a state board of health was established, consisting of seven physicians appointed by the governor from different sections of the state, who are required to make sanitary investigations, and collect and disseminate information concerning the causes of disease and the effects of localities, occupations, &c., on the general health. The public institutions are also made subject to their sanitary inspection, and they are required to report annually to the legislature. The state commissioner of statistics makes an annual report to the legislature, embodying the vital statistics of the state, agriculture, property, taxation, &c. The constitution provides for the taking of a state census in 1865 and every ten years thereafter. The property, real or personal, owned by a married woman at the time of her marriage, continues to be her separate property. During marriage she may use and enjoy property and the earnings of her industry free from the husband's control and from liability for his debts. She may contract, and sue and be sued, as if she were single, the husband not being liable for her debts or contracts either before or during coverture, except for necessities furnished to the wife after marriage. In sales of real estate by a married woman, however, the husband must join in the conveyance, unless he has deserted her for one year or she has cause of divorce against him. The causes of divorce are adultery, impotence, cruel and inhuman treatment, sentence to imprisonment in the state prison, wilful desertion for three years, habitual drunkenness for a year, and cruelty. A married woman may make a will without the consent of her husband. A homestead comprising not more than 80 acres of land in the country with the buildings, or one lot with the building thereon in any town, city, or village, is exempt from execution. The legal rate of interest is 7 per cent. in the absence of agree-

ment; but any rate not exceeding 12 per cent., if agreed upon, will be valid. Registry of births and deaths is required to be made by the clerk of every city and town. Minnesota is represented in congress by three representatives and two senators, and has therefore five votes in the electoral college.—The acknowledged bonded debt of the state on Jan. 1, 1875, amounted to \$480,000, which has been contracted since 1867 for the erection of buildings for state institutions. (For an account of the disputed indebtedness of the state see p. 611.) During the year ending Dec. 1, 1874, the entire revenue of the state amounted to \$1,112,812, and the expenditures to \$1,148,150. The chief items of the receipts and disbursements are represented in the following statement:

RECEIPTS.	
State taxes collected.....	\$575,164
Tax on gross receipts of railroad companies.....	129,907
" " " of insurance companies.....	23,505
Fees of insurance companies.....	4,345
Taxes of telegraph companies.....	678
State prison labor.....	9,684
Board of United States convicts.....	6,772
Sale of state bonds.....	20,000
" of school lands.....	63,196
" of timber on school lands.....	23,428
" of university lands and timber.....	11,070
Interest on permanent school fund.....	158,081
" " university fund.....	10,555
" " state deposits.....	9,270
" " bonus railroad bonds.....	10,925
Internal improvement fund.....	17,413

DISBURSEMENTS.	
Legislative.....	\$69,810
Executive.....	43,564
Judicial.....	45,694
Public printing.....	49,366
Support of state prison.....	34,857
" of reform school.....	30,000
" of soldiers' orphans.....	20,017
" of deaf, dumb, and blind.....	20,006
" of hospital for insane.....	84,500
" of normal schools.....	26,250
" of state university.....	30,000
Erection of public buildings.....	158,099
Interest on state bonds.....	31,255
School fund apportioned.....	194,654
Purchase of bonds for invested funds.....	168,757
Appropriations from internal improvement fund.....	14,518
Frontier relief.....	31,970
Interest coupons, bonus railroad bonds.....	10,562
Support of agricultural societies.....	3,000
Geological survey.....	2,000
Teachers' institutes and training schools.....	2,710
State historical society.....	2,980

The total equalized valuation of taxable property was \$39,264,740 in 1861, \$45,184,063 in 1865, \$87,133,673 in 1870, \$112,035,561 in 1873, and \$217,427,211 in 1874. The great increase of the last year is due largely to a new tax law requiring property to be assessed at its cash value. The total for 1874 includes 13,741,404 acres of land, exclusive of town and city lots, valued with buildings at \$113,410,620; town and city real estate, \$58,994,793; personal property, \$45,021,798. Besides this, 90,533 persons had each \$100 of property exempt, or \$9,053,300. The total taxes levied on this equalized valuation amounted to \$4,102,835, including \$507,369 for state purposes, \$1,331,772 for common schools (a two-mill tax yielding \$433,193 and a special tax of \$898,-

St. Paul, opened in 1868, is intended for incorrigible and criminal boys and girls under the age of 16 years. At the beginning of 1874 there were in the institution 107 boys and 13 girls, all of whom were receiving instruction in the ordinary branches and industrial pursuits. Provision has been made for the establishment of an asylum for inebriates.—The permanent school fund is derived from the proceeds of the school lands, which comprise every 16th and 36th section, constituting one eighteenth of the entire public domain. It is estimated that these lands will amount to 2,900,000 acres. At the beginning of 1875, 450,357 acres had been sold, from which and the sales of timber a productive fund of \$3,030,127 had been realized. The income of this fund amounted to \$189,826 in 1874, which was distributed among the counties in proportion to the school population. The total distribution (\$192,264) was based on the school population of 1873, 136,065, making the per capita apportionment 98 cents. The principal of this fund is protected by the constitution against diminution; and it is estimated that when the remainder of the school lands are sold the permanent school fund will exceed \$15,000,000. The state superintendent of education is appointed by the governor, with the consent of the senate, for two years, and receives an annual salary of \$2,500. County superintendents are appointed by the county commissioners. The most important statistics for the year ending Sept. 30, 1874, are given in the following statement:

Number of persons between 5 and 21 years old.....	210,194
" " 15 and 21.....	57,603
" " of school districts.....	128,002
" " " reporting.....	8,266
" " " " ".....	8,114
Number of winter schools.....	2,769
Average length in months.....	8-35
Total attendance.....	99,842
Average.....	71,862
Number of summer schools.....	2,713
Average length in months.....	8-11
Total attendance.....	81,781
Average.....	56,348
Number of teachers in all schools (male 1,834, female 8,648).....	5,582
Average monthly wages of teachers, male.....	\$41 46
" " female.....	\$28 91
Number of school houses.....	2,788
Value.....	\$2,288,700
Amount received from school fund, including 2-mill tax, fines, &c.....	\$862,708
Amount apportioned from primary school fund.....	192,264
received from taxes voted by districts.....	\$89,890
" " expended for school purposes, total.....	\$1,185,442
" " " for teachers' wages.....	\$678,606
" " " for school houses.....	\$328,001

According to the federal census of 1870, the total number of educational institutions in Minnesota was 2,479, having 2,886 teachers, of whom 1,907 were females, and 107,264 pupils. The total income of all was \$1,011,769, of which \$2,000 was from endowment, \$903,101 from taxation and public funds, and \$106,668 from tuition and other sources. There were 2,424 public schools with 2,758 teachers and 103,408 pupils, 4 colleges with 81 teachers and 524 students, 3 academies having 10 teachers and 133 pupils, and 23 private schools with 28 teachers

and 959 pupils. In 1874, 487 pupils were instructed in academies, 582 in colleges, and 2,980 in private schools, making with those in the common and normal schools a total of 133,854. Minnesota has three state normal schools: at Winona, opened in 1860; Mankato, 1868; and St. Cloud, 1869. The number of instructors and pupils in these during the year ending Nov. 30, 1874, together with the annual appropriation made by the legislature, was as follows:

NORMAL SCHOOLS.	Instructors.	PUPILS.			Appropriations.
		Model department.	Normal department.	Total.	
Winona.....	11	261	235	516	\$12,000
Mankato....	5	46	171	217	10,000
St. Cloud....	6	48	122	170	6,000
Total	22	355	548	903	\$28,000

For the further training of teachers, the superintendent of public instruction is required to hold annually in the thinly settled counties as many state teachers' institutes as practicable, each to continue in session at least one week. In 1874 six training schools of four weeks each and five institutes of one week each were held in 11 counties, and were attended by 1,024 teachers. The expense, \$2,710, was borne by the state. These institutes are regarded as an important feature of the public school system. Applicants for position as teachers, if not graduates of a normal school, are required to obtain a graded certificate, which is granted on examination by county superintendents.—The state university is described in the article MINNESOTA, UNIVERSITY OF. Carleton college (Congregational), at Northfield, was organized in 1866, and has an English preparatory and a collegiate course, which are open to students of both sexes. In 1873-'4 it had 10 instructors and 171 pupils, of whom 7 were in the college and 165 in the preparatory department; 64 were females. St. John's college is an important Roman Catholic school at St. Joseph's, organized in 1856, and having in 1873-'4 22 instructors and 26 students in the ecclesiastical and 97 in the classical and commercial course. Macalester college (Presbyterian) at Minneapolis was opened in 1874. Besides the theological department of St. John's college, instruction in theology is afforded by Augsburg seminary (Evangelical Lutheran) at Minneapolis, which was founded in 1869, and in 1873 had 5 instructors and 63 students. The only institution exclusively for the higher education of women which reported to the United States bureau of education in 1873 was St. Mary's Hall at Faribault (Protestant Episcopal), which in 1873-'4 had 14 instructors and 114 pupils. There are, however, seminaries for the secondary instruction of girls at Hastings, Minneapolis, and St. Paul. There are also several well conducted academies open to boys and girls in St. Paul, Red Wing, Caledo-

nia, and other places. There are from 15 to 20 excellent high schools in the state, in which students may be prepared to enter the state university. Several private schools afford instruction in the Norwegian and Swedish languages. There are business colleges in St. Paul and Minneapolis.—According to the census of 1870, there were in the state 26,763 libraries, with an aggregate of 2,174,744 volumes; 23,761 with 1,596,118 volumes were private, and 3,002 with 578,631 volumes were other than private, including the state library of 10,000 volumes, and 23 circulating libraries containing 16,601 volumes. Besides the state library, the most important ones are that of the university of Minnesota, which contains about 10,000 volumes; St. Paul library, 6,000; the Minneapolis Athenæum, 4,000; and that of the state historical society at St. Paul, which has 5,643 bound and 8,730 unbound volumes. The whole number of newspapers and periodicals was 95, having an aggregate circulation of 110,778 copies, and issuing annually 9,543,656. There were 6 daily, with a circulation of 14,800; 5 tri-weekly, 4,200; 79 weekly, 79,978; and 5 monthly, 11,800. In 1874 the number reported was 128, including 7 daily, 4 tri-weekly, 112 weekly, and 5 monthly. The total number of religious organizations in 1870 was 677, having 582 edifices, with 158,266 sittings and property valued at \$2,401,750. The denominations were represented as follows:

DENOMINATIONS.	Organizations.	Edifices.	Sittings.	Property.
Baptist, regular.....	80	43	11,135	\$140,400
" other.....	14	7	1,800	19,100
Christian	6	6	1,550	7,450
Congregational.....	57	29	11,400	443,200
Episcopal, Protestant.	64	54	14,765	400,500
Evangelical Assoc'n.	20	16	8,875	24,100
Lutheran.....	185	97	23,825	222,150
Methodist	225	106	26,880	337,550
Moravian.....	6	5	1,400	8,500
New Jerusalem.....	1	1	200	2,200
Presbyterian, regular.	75	59	16,756	273,000
" other.....	1	1	200	2,000
Reformed church (late German Reformed).	2	2	400	45,000
Roman Catholic.....	154	135	42,370	755,000
Second Advent.....	7	1	150	2,100
United Brethren in Christ.....	5	2	500	1,000
Universalist.....	18	6	1,720	55,000

—Though of recent settlement, Minnesota has long been the seat of a considerable traffic with the Indians, and of missionary enterprise. As early as 1680 Hennepin and La Salle penetrated these wilds, followed by La Hontan and Le Sueur, and in the last century by Carver; and within the present century this region has been thoroughly explored by Pike, Long, Keating, Nicollet, Schoolcraft, Owen, and others. But it was not until 1812 that the United States had any authority within the limits of Minnesota. In 1816 a law was passed excluding foreigners from the Indian trade; and the military post at Fort Snelling was established

in 1819. In 1837 a small tract of country between the St. Croix and Mississippi was ceded by the Indians to the United States, and lumbering operations commenced upon the St. Croix. The territory of Minnesota was established by an act of congress passed March 3, 1849, and the government was organized in June. It embraced nearly twice the area of the present state, its western limits extending to the Missouri and White Earth rivers. Up to this period the country was occupied almost entirely by Indians; but a small civilized population of whites and half-breeds had grown up around the trading posts and mission stations, amounting in 1849 to 4,857. In 1851 the Sioux ceded to the United States all their lands in the territory W. of the Mississippi to the Big Sioux river. The population increased so rapidly after this, that in 1857 application was made for admission into the Union. In the convention assembled to frame a state constitution, a dispute arose among the delegates, which resulted in the secession of a portion and the formation of another convention. The two conventions, known as the republican and the democratic, held sessions at the same time in St. Paul. A compromise was effected, and the same constitution was signed by the delegates of both conventions and submitted separately to the people by each convention, with the names only of its officers and delegates. It was ratified by an overwhelming majority. According to the census ordered in the enabling act, and dated Sept. 21, 1857, the territory contained 150,092 inhabitants. The act authorizing the formation of a state government passed congress Feb. 26, 1857, and the state was admitted into the Union May 11, 1858, with the boundaries above described. That portion of the state lying on the E. side of the Mississippi originally belonged to the country termed the "Territory Northwest of the Ohio," and had the ordinance of 1787 been fully complied with would have been included in the fifth state (Wisconsin) formed from that region. This section comprises an area of 22,336 square miles. The part of the country lying W. of the Mississippi, and embracing more than two thirds of its area, was originally a portion of Louisiana, and came into the possession of the United States in 1803; and before it was included in Minnesota it had been a part of the territory of Missouri, and subsequently of Iowa. There are bonds amounting to \$2,275,000 outstanding against the state, the validity of which has been disputed. These bonds were issued in 1858 and lent to railroad companies, upon the authority of an amendment to the constitution made in that year. Soon after receiving them the companies, as is alleged, failed to comply with the conditions upon which the bonds were granted, and payment was refused by the state. In 1860 another amendment to the constitution was adopted "expunging" the amendment of 1858, and providing that "no law levying a tax or

making other provisions for the payment of principal or interest of the bonds denominated Minnesota state railroad bonds shall take effect or be in force until such law shall have been submitted to a vote of the people of the state and adopted by a majority of the electors of the state voting upon the same." Before this amendment was adopted the mortgages held by the state had been purchased and the mortgaged railroads bought by the government at nominal prices. In May, 1871, a popular vote was taken on a proposition for settlement by arbitration of these claims, when 21,499 votes were cast against and 9,293 in favor of the proposition, the total vote being less than half the average vote of the state. The total number of men furnished by Minnesota to the army and navy during the civil war was 25,034, or 19,675 reduced to a three years' standard.

MINNESOTA, or **St. Peter's**, a river of Minnesota, having its source in a series of lakes on the Dakota border, between lat. 45° and 46° N., and pursuing a S. E. course for about 320 m. to its confluence with the Blue Earth; then turning N. E. it flows in that direction for about 120 m., falling into the Mississippi at Mendota. Its course is principally in the valley lying between the Coteau du Grand Bois and the Coteau des Prairies. For its whole distance from Big Stone lake it has a fall of only 220 ft. It is navigable for steamers about 40 m. to a point where at low water a ledge of rocks obstructs further progress; but ordinarily small boats can ascend to Patterson's rapids, 295 m. from its mouth.

MINNESOTA, University of, an institution of learning in Minneapolis, Minn., beautifully situated on a bluff on the E. bank of the Mississippi river, one mile below the falls of St. Anthony. The college grounds comprise about 30 acres. The experimental farm of the agricultural college is about half a mile below, near the Bridal Veil falls. The buildings comprise a main academic edifice, 180 by 90 ft. and four stories high, and an agricultural college, 150 by 54 ft., two stories high, including a chemical laboratory and a plant house of glass. The total cost of these buildings was \$100,000, appropriated by the state. The university had a nominal existence, under a provision of the state constitution, as early as 1857, but it was not till 1867 that a preparatory department was opened. In 1868 the university was reorganized, and to the board of regents was intrusted the income to be derived from the state's share of the lands given in 1862 by the general government for the endowment of colleges of agriculture and the mechanic arts. In September, 1869, the first faculty was organized, the president being William W. Folwell, M. A., who still retains that office (1875). In 1870 the board of regents adopted a plan of university organization in some respects novel. The work of the first two years of the ordinary college course was merged with the last two years of the existing preparatory department

into a department of elementary instruction, otherwise called the collegiate department. Having completed a four years' course in the collegiate department, the student then has his option to enter at once some one of the professional schools, or to proceed with higher academical studies in the college of science, literature, and the arts. The collegiate department is merely a temporary attachment, it being part of the plan of organization to drop off its studies as fast as the schools can assume them. The lowest class is to be discontinued at the close of the year 1874-'5. In 1875 the following colleges or departments, with the courses and degrees named, had been opened: 1. The collegiate department, known in the organic law as the department of elementary instruction, having three courses of study: classical, scientific, and modern. The faculty have authority to permit students to select studies from the various courses, but the programme is arranged with reference to the wants of the regular students. No degrees are conferred in this secondary department. 2. The college of science, literature, and the arts, which presents a similar variety of courses, but with a large increase of options. The degrees of B. A., B. S., and B. L. are conferred upon students who complete the respective courses and pass the examinations. 3. The college of agriculture, offering an advanced or university course, based on the preparation of the collegiate department and leading to the degree of B. Agr.; and an elementary course coinciding in the main with the scientific course of the collegiate department. 4. The college of mechanic arts, with courses in civil engineering, mechanical engineering, and architecture, leading to appropriate baccalaureate degrees. Post-graduate courses are to be arranged, leading to the master's and other higher degrees. In 1870 the announcement was made, "No degrees except upon examinations." The government of the university is vested in a board of ten regents, of which the governor, the superintendent of public instruction, and the president of the university are members *ex officio*, the remaining seven being appointed by the governor with the consent of the senate, and holding their offices for three years. No applicant is admitted to the university without examination, and the only tests of progress are the examinations. The university maintains no dormitories. Tuition is free in all departments. Both sexes are admitted. The number of students in 1874-'5 was 285. The faculty numbered 14 resident officers and one non-resident. The library contained about 10,000 volumes. By a law of 1872 the geological and natural history surveys of the state were intrusted to the university. Considerable collections have been made by the professors engaged in the surveys. The financial basis of the university consists in the following grants of public lands: 1, 46,000 acres to the territorial university; 2, 46,000

acres to the state university; 3, 120,000 acres, being the so-called agricultural grant of 1862, for the benefit of colleges of agriculture and the mechanic arts; 4, 12 sections of salt lands for the expenses of the geological survey. In 1874 the state legislature made an annual appropriation of \$19,000. The total annual income at that time amounted to \$30,000, the institution still retaining about 135,000 acres of public lands, all within the state.

MINNETAREES, a tribe of Indians on the upper Missouri, who are called by the Canadians Gros Ventres of the Missouri, but by themselves Hidatsa. They were originally part of the Crow nation, but separated from it after a quarrel. They came to the Mandans in a state of destitution, nearly all the men having fallen in battle. The Mandans did not allow them to enter their village, but permitted them to settle near. They gradually recovered, and adopted many Mandan customs and ideas, but have retained their own language. Lewis and Clarke in 1804 found the tribe in two villages on opposite sides of Knife river near the Missouri. They numbered 2,500, and traded with the great English fur companies, defending themselves against the Sioux, and making war on the Shoshones and Flatheads. The United States made a treaty with them at the lower Mandan village, July 30, 1825. They have never been hostile to the whites. When the smallpox swept away most of the Mandans in 1838, the Minnetarees were reduced to about 500. In 1842 they numbered about 300 males and 800 females, in 75 lodges, their village lying about 8 m. above the Mandans; but in 1845, under the constant attacks of the Sioux, they united with a part of the Mandans in a palisaded village at their present site, where Fort Berthold was erected the same year. They were then estimated at 760 souls. Though a treaty was made at Laramie in September, 1851, to which they adhered, the Sioux continued their hostilities, and in 1862 killed Four Bears, their head chief, a man of remarkable ability. During the civil war no arms or ammunition was issued to these tribes, while the Sioux procured supplies from the British territory, and in spite of all treaty obligations killed and plundered these unoffending Indians, who were unable to go on their usual hunts. They ceded some of their lands in 1864. In 1870 peace was again made with the Sioux and arms were furnished to the Minnetarees; at the same time a reservation in Dakota and Montana was set apart for them, but in 1873 they were still at Fort Berthold. They are reduced to 528, the Mandans, and since 1863 the Rickarees occupying part of the village. The Minnetarees are tall, well made, and light in color. They dwell chiefly in peculiar earth-covered lodges like those of the Mandans, 30 to 50 ft. in diameter. Every winter they go many hundred miles up the Missouri and Yellowstone valleys to hunt. Their religious ideas and rites are similar to those of the Man-

dans. No attempt has been made to civilize or Christianize them beyond occasional visits of Roman Catholic missionaries. An account of the tribe and its language is given in Washington Matthews's "Grammar and Dictionary of the Hidatsa" (New York, 1873); see also "Hidatsa (Minnetaree)-English Dictionary" (New York, 1874).

MINNOW, the common name of many small cyprinodont fishes, of the genera *fundulus* (Lacép.) and *hydrargyra* (Lacép.). In *fundulus* the upper surface of the head is flattened; fine card-like teeth upon the jaws, and short ones on the posterior part of the hyoid arch, with opposite velvet-like patches on the roof of the mouth; no teeth on palate or vomer; branchial rays five; dorsal opposite the anal, and caudal rounded; upper surface and sides of head covered with scales. The common minnow, or "cobble" of the young smelt fishers (*F. pisculentus*, Cuv. and Val.), is from 1 to 5 in. long; the females are of a uniform brown color; the males with lighter intervals on the sides arranged like transverse bands, the dorsal and anal with black dots, and anal slightly emarginated posteriorly, mouth protractile, and upward when closed. It abounds about the salt marshes of the northern and middle states, and is caught in large numbers in hand nets, as bait for other fish, particularly



Minnow (*Fundulus pisculentus*).

smelts.—The yellow-bellied minnow (*hydrargyra flavula*, Storer) is from 1 to 5 in. long; the female is yellowish green above, lighter on the sides, and white beneath, with from one to five longitudinal interrupted black bands extending along the sides from the gill covers to near the tail, where there are three or more indistinct transverse bands. In this genus the head is more flattened, and the branchial rays are six. It is found in southern New England and New York.—The cyprinoid black-nosed dace (*argyreus atronasus*, Heck.) is sometimes called brook minnow. The British minnow or minim (*leuciscus phoxinus*, Cuv.) rarely exceeds 3 in. in length; it is generally found in the same streams with trout, swimming in shoals.

MINO BIRD (*gracula religiosa*, Linn.), a conirostral bird of the starling family and subfamily *graculinae*. In this genus the bill is as long as the head, broad at the base and strong, with the culmen curved, sides compressed and nearly straight, and tip slightly notched; nostrils partially covered by the frontal plumes; wings long, with the first quill rudimental, and the second shorter than the third and fourth, which are longest; tail short and nearly even; tarsi shorter than the middle toe, stout, and covered

with strong scales; toes long, the outer the longest, and the hind one very long and strong; claws curved and robust; some parts of the head are naked or carunculated. This species, the best known of the genus, is about 10½ in. long, of which the tail is 3, and the expanse of wings 19 in.; the body is round and plump;



Mino Bird (*Gracula religiosa*).

the color is velvet black, with green, blue, and purple reflections; on the wings is a white speculum; the bill, feet, and caruncles behind the eyes, yellow. It is found in Java, Sumatra, and other islands of the East Indian archipelago, inhabiting the jungles, where it is seen in pairs or small parties in the tops of lofty trees, searching for fruits, berries, and insects. It is easily domesticated, and becomes very familiar; it soon learns to whistle, sing, and talk, imitating the human voice, according to Latham, more nearly than any other bird; it is frequently kept as a cage bird in the East Indies, and sometimes in Europe and in this country, where as much as \$100 has been paid for a single bird. Another species, with similar habits, is the musical grackle (*G. musica*, Temm.), found also in the East Indies.

MINORCA (Span. *Menorca*; anc. *Balearis Minor*), the second in size of the Balearic islands, lying 24 m. E. N. E. of Majorca, about 125 m. S. E. of Barcelona, between lat. 39° 47' and 40° 5' N., and lon. 3° 50' and 4° 23' E.; greatest length 33 m., greatest breadth 13 m.; area, 288 sq. m.; pop. about 45,000. The coast is indented on every side with small bays, several of which form excellent harbors. The surface is rugged, and rises gradually toward the centre, where it attains in Monte Toro an elevation of nearly 5,000 ft. The climate is very hot in summer and cold in winter, and the soil is rather sterile. Iron, lead, copper, and marble are found. The inhabitants are almost entirely engaged in agriculture, fishing, and commerce. Minorca is of great commercial importance in the Mediterranean trade, and the capital, Port Mahon, has an excellent harbor. During the greater part of the 18th century Minorca belonged to the British, who ceded it to Spain at the peace of Amiens (1802). (See **BALEARIC ISLANDS**.)

MINORITES. See FRANCISCANS.

MINOS, in Greek mythology and legends, a Cretan hero and lawgiver. According to Homer, he was the son of Jupiter by Europa, brother of Rhadamanthus, and the father of Deucalion and Ariadne. The logographers make him also the brother of Sarpedon and husband of Pasiphaë. Some later writers distinguish two kings of the name, grandfather and grandson, but only one Minos was known to Homer, Hesiod, or the poets and historians to the time of Aristotle. To obtain possession of the throne of Crete, he affirmed that the gods granted to him everything for which he prayed. He accordingly prayed that a bull might come forth from the sea, and promised to sacrifice it to Neptune. The bull appeared, and he obtained the kingdom; but, admiring the beauty of the animal, he sacrificed another in its place. Thereupon Neptune afflicted his wife Pasiphaë with a monstrous passion for the bull, for the gratification of which the inventor Dædalus contrived means, and she became the mother of Minotaur, a creature with the body of a man and the head of a bull, which was imprisoned by Minos in the Cnosian labyrinth. The Cretans traced their legal and political institutions to Minos, and he was said to have been instructed in the art of law-giving by Jupiter himself; and Lycurgus was believed to have followed his legislation as a model. After death he was constituted one of the judges in Hades. Later accounts represent him as an unjust and cruel tyrant. He is said to have acquired great maritime power, conquered the Ægean islands, made war upon Athens, and compelled the Athenians to send to Crete periodically a tribute of seven youths and seven maidens to be devoured by the Minotaur. Theseus with the aid of Ariadne at length slew the monster and abolished the tribute. In a subsequent attempt to conquer Sicily Minos failed and was killed.

MINOT, George Richards, an American jurist, born in Boston, Dec. 28, 1758, died Jan. 2, 1802. He graduated at Harvard college in 1778, practised law in Boston, became clerk of the Massachusetts house of representatives in 1781, secretary of the convention which ratified the federal constitution, judge of probate for the county of Suffolk in 1792, and judge of the municipal court of Boston. He published an oration on the Boston massacre; a "History of Shays's Rebellion" (8vo, 1788); "Eulogy on Washington" (1800); and a "History of Massachusetts Bay" from 1748 to 1765 (2 vols., 1798-1803), in continuation of Gov. Hutchinson's.

MINOTAUR. See MINOS.

MINOT'S LEDGE. See LIGHTHOUSE.

MINSI. See MUNSEES.

MINSK. I. A S. W. government of European Russia, bordering on Vitebsk, Mohilev, Tchernigov, Kiev, Volhynia, Grodno, and Wilna; area, 35,295 sq. m.; pop. in 1867, 1,135,588. The territory of Minsk is a vast plain, over

which are scattered a few hills of moderate elevation. In the north and east are large forests, and toward the south and southwest extensive marshes. The principal rivers are the Dnieper (which partly bounds it on the east), Niemen, Pripet, and Beresina. The climate is very severe in winter, but pleasant in summer. Agriculture is the principal occupation. The chief manufactures are fine cloths, linen, and sugar. The principal exports are timber, salt, and grain, which are brought by the rivers to the ports of the Baltic and Black seas. The population is composed chiefly of Lithuanians, Poles, Russians, and Jews. Five sevenths of them adhere to the Greek church. The inhabitants of the southern marshy portion are subject to the disease called *plica Polonica*. Among the more important towns are Pinsk and Slutsk. Minsk is divided into 10 circles, and was formerly a part of the Lithuanian provinces of Poland. II. A city, capital of the government, on the Svislotch, 110 m. S. E. of Wilna; pop. in 1867, 36,277, a large part of whom are Jews. It is the seat of a Greek archbishop and a Roman Catholic bishop. It has a fine cathedral, a number of other churches, a gymnasium, and a theatre. An important trade in grain is carried on. The nuns of Minsk were subjected to persecution by the emperor Nicholas in 1840.

MINSTRELS (Lat. *minstrellus*, diminutive of *minister*; Fr. *ménestrel*), a class of men in the middle ages who amused their patrons by the arts of poetry and music, singing to the harp their own verses, or the popular ballads and metrical histories of the time. They sometimes accompanied their music with mimicry and action, so that they were often called *mimi* and *histriones*. The name minstrel is of Norman origin, and they were successors of the skalds and bards of the north. The office became degraded, the minstrel on the continent being commonly classed with the dancer and mimic; while the Latin names *mimi*, *scenæ*, *histriones*, and *joculatores* are grouped together. In England Edward II., Henry V., and Henry VI. showed great regard for minstrels; but the reign of Richard Cœur de Lion was their golden age. When Henry V. set out on his great expedition to France, 18 minstrels, with an allowance of 12*d.* a day each, accompanied him. But from the reign of Edward IV. their art seems to have declined. Toward the close of Elizabeth's reign a statute was enacted, by which wandering minstrels were punished along with rogues, tinkers, peddlers, vagabonds, and beggars.

MINT, the name of plants of the genus *mentha* (from Mintha, a nymph changed into this plant), of the order *labiata*, which is distinguished from related genera by an almost regular corolla and four fertile stamens; there are about 30 species, but few of which have any other than a botanical interest. Generally, when mint is spoken of, that which is also known as spearmint (*M. viridis*) is understood, while the

common names of the other species have a descriptive prefix. Spearmint, common mint, garden mint, or usually simply mint, is a native of Europe, though found about moist ground



Spearmint (*Mentha viridis*).

and waste places in the United States, having strayed from gardens and fields where it has been cultivated. It is handsome, cleanly, of a deep green color, with an erect stem 1 to 2 ft. high, furnished with oblong-lanceolate, nearly sessile, acutely serrate leaves, and ending in slender, tapering spikes of pale purple flowers. The fresh leaves, chopped fine and mixed with sugar and vinegar, form the mint sauce much eaten with lamb, and bruised they are used for compounding various beverages, especially mint julep. An oil, upon which the properties of the plant depend, is separated by distillation in the same manner as described for peppermint; from this is prepared an essence, by dissolving it in alcohol, and a water, by mixture with that liquid, both of which are used to cover the taste of other medicines.—Peppermint (*M. piperita*) is more sparingly naturalized than the preceding, from which it differs in its more interrupted spikes and petioled leaves; it has a more pungent and camphorous taste and similar stimulating properties. The plant is largely cultivated for the production of the oil of peppermint, a culture that was at one time exclusively confined, in this country, to Massachusetts, the western part of New York, and some counties in Ohio, but was later taken up by the farmers in southwestern Michigan, where some years ago the breadth of land devoted to this crop was between 2,000 and 3,000 acres. At one time St. Joseph's county, Mich., was the headquarters for oil of peppermint, but recently the makers in Wayne county, N. Y., have by attention to the quality of the product established a reputation which has led to increased production, and this county now produces more in value if not in quantity than any other district. Those engaged in the

business have met with variable success, as the oil has been the subject of the operations of speculators; at one time the whole production of the country was controlled by a single firm, which in order to diminish the supply contracted with many large growers to discontinue the cultivation for five years. Peppermint requires a warm, rich soil; the land is laid off in furrows 15 to 24 in. apart, and sets, or parts of old plants, are planted thickly in the rows; the plants are kept free from weeds until they cover the soil; the harvest begins early in August and continues until October; the first crop of the field is the best, the second and third being much less; the fourth year the field is ploughed, and the crop springs up from the broken roots; the yield of the fifth year is about equal to that of the second, and after this the land is diverted to other uses. The first year's crop is best, not only because the plants are young and vigorous, but the mint is then free from a weed which is apt to spring up later, and also yields a volatile oil, which is bitter and pungent, and deteriorates the product; this weed, called mare's-tail, fireweed, and by several other names, is *erecthrites hieracifolius*, a composite somewhat resembling lettuce in appearance. The mint is cut with a cradle having two fingers, and raked into cocks, where it remains 12 hours to wilt before it is distilled. The still is a wooden vat of heavy staves hooped with iron, $4\frac{1}{2}$ ft. deep and 6 ft. in diameter; the wilted mint is packed into this vat by treading it close with the feet until the vat is full, when the lid is fastened down steam-tight; a pipe enters the lower part of the vat to convey steam from a boiler, and another from the top of the vat connects with a worm, as in an ordinary still. The steam being let on, the oil from the mint is volatilized, and its vapor, mixed with steam, is condensed in the worm; the mixed oil and water are collected in a receiver, when they separate by their difference in specific gravity. The oil is packed in tin cans holding 20 lbs. each, and a large share of the product is exported. The chief consumption of the oil is for flavoring confectionery, and it also enters into the preparation of essences, cordials, and the like. Essence of peppermint, a popular carminative, is a solution of the oil in alcohol, of a strength proportioned to the price. Peppermint water is prepared like other similar waters by first rubbing up the oil with carbonate of magnesia, slowly adding water, and filtering, a fluid dram of the oil to a pint of water; the use of the magnesia is to finely divide the oil and expose a large surface to the water, in which it is slightly soluble; any other inert powder will answer as well.—Corn mint (*M. arvensis*), which has the odor of decaying cheese, the round-leaved mint (*M. rotundifolia*), the water mint (*M. aquatica*), and the whorled mint (*M. sativa*), are other European species naturalized in some localities, but mostly rare.—Our only native species, the wild mint

(*M. Canadensis*), is a common plant in damp places from Kentucky northward; it has hairy stems and leaves, and flowers in axillary whorls; its taste and odor are like those of pennyroyal. A smooth form of this, which has been called *M. borealis*, has a pleasanter odor.

MINT (Ang.-Sax. *mynet*, from *mynetian*, to mark), a place where money is coined by a government. The early methods of coining money were exceedingly imperfect. The metal, brought to the required standard of fineness, was melted and cast into small bars, which were reduced to thin plates under the hammer. Square pieces cut from these plates were rounded at the forge, and then by means of rude dies, one fixed like an anvil, and the other held in the hand and struck with a mallet, the round lump of metal was flattened and coined at the same time. The coins were apt to be irregular in weight and form, and not entirely round, and were liable to be clipped. It was not until the middle of the 17th century that the forge and the hammer gave way permanently in France and England to the mill and screw.—In Britain, in the 1st century of the Christian era, Cunobelin, king of the countries lying between the Thames and the Nene, established his mint at Camulodunum (Colchester), and there coined money of gold, silver, and brass. In early Saxon and Norman times establishments under the crown for the coinage of money existed in almost every important town. In the reign of Ethelred II. (978–1016) there were 38 mints, and in that of Canute (1016–1035) 37. In those days communication between the different parts of the realm was at once difficult and dangerous, and it therefore became important to have the sources for the supply of money for the various districts within those districts. After the Norman conquest the number of these mints was gradually reduced, so that in the reign of Henry VI. (1422–'60) the only ones in England were at Bristol, Canterbury, Coventry, Durham, London, Norwich, Oxford, and York; in the reign of Henry VII. they were only at Canterbury, Durham, York, and London; and it is supposed that in the time of Elizabeth all coins were made at the mint in London. But when, in the reign of William III., a very extensive coinage of silver took place, several local establishments outside of London were employed. Athelstan appears to have been the first monarch who established any regulations for the government of the mints of the kingdom. His law, proclaimed about 928, provided that but one sort of coin should pass current, and granted to various towns each a number of coiners or moneyers, and to boroughs of inferior size each one moneyer. All provincial mints received their dies from the mint of London. The moneyers coined money and distributed it, received that which was clipped or worn, and bought bullion, the right to do which the monarch claimed as his own exclusive privilege. The moneyers seem in those early times to

have had almost entire control of the mints. Their names were stamped upon the coins, as a guarantee of their genuineness, as early as the time of Egbert, king of Kent, about the middle of the 7th century. Edward II., in the 18th year of his reign, made a considerable change in the organization of the mint. He appointed a master, warden, comptroller, king's and master's assay master, and king's clerk; and under this constitution it continued substantially till 1815. From an early period in English history, the clergy of the superior ranks shared with the king the prerogative of coinage; the bishops of Durham had for centuries enjoyed the privilege of coining sterling and pennies, and about 1473 the then bishop, who did not consider himself authorized to coin halfpence without obtaining the king's permission, applied for it, and it was granted. During the civil war in the reign of Stephen, when the country was in great disorder, almost every baron usurped the prerogative of coining and issuing money, which consequently became very much debased. In 1156 Henry II. issued a new coinage, and prohibited the use of any other money. Hammer money passed current in England until the reign of William III., although the system of milling had been introduced from France in 1562, during the reign of Queen Elizabeth; but it remained in practice only ten years, when the old system was again resorted to on account of its greater cheapness. The invention of the mill for coining is attributed to Antoine Brueher, a French engraver, who first tried it in Paris, in the palace of Henry II., for coining counters. It was continued in use till 1585, in the reign of Henry III., when it was abandoned on account of its expense. In 1681 a commission was appointed in England to examine into the process of coining milled money proposed by Nicholas Bryitt of Lorraine; but nevertheless all coins continued to be hammered till 1662 or 1663, when the milling process was finally and permanently adopted; and Bryitt seems to have been appointed chief engraver to the mint, and to have put the system into practice. It had already been adopted in France in 1645.—The early milling operations employed four different machines: the rolling mill, for laminating the metals to plates of the proper thickness; the punching-out machine (fig. 1), for cutting out the blanks or planchets; the machine for milling the edges (fig. 2); and the coining press (fig. 3), which stamped the impression on both sides at once. The hammer money which was called in by William III. had been so much clipped and filed as to have lost about half its value.

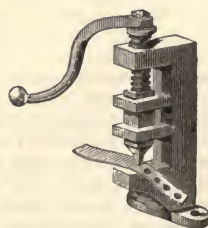


FIG. 1.—Punching-out Machine.

Such confidence was felt in the new money by reason of its being milled on the edge, that it was deemed almost if not quite impossible to abstract any portion of the metal from it. But

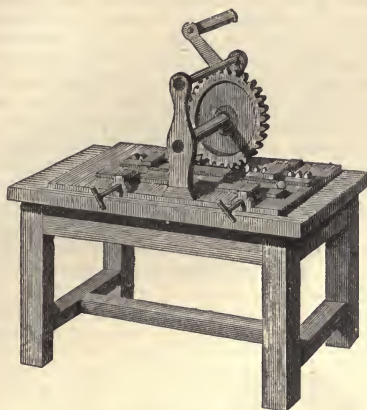


Fig. 2.—Machine for Milling Edges.

it was soon found that this money could with facility be subjected to the "sweating" process, in which a portion was dissolved by acids from the surfaces of both gold and silver coin

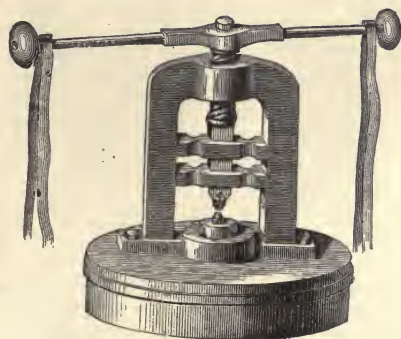


Fig. 3.—Coining Press.

without being perceptible to the eye. In 1810 the mint, which from an early age had existed in the tower of London, was removed to a new building on Tower hill, with new and improved machinery and engines. In 1815 it was placed under a new system of organization, which lasted till 1851, when it was again re-organized.—Seigniorage, the deduction made from the bullion to cover expenses and to pay the sovereign for his prerogative, at one time formed a considerable part of the revenues of the crown; and it was not always fixed by law or uniform in amount, but was very often subject to the caprice of the monarch. In the time of Henry III. it was 6*d.* in the pound, and Henry VIII. had 50*s.* for every pound weight of gold coined. Charles II. relinquished it en-

tirely, but in the reign of George III. it was again imposed upon the silver coinage, and when the market price of silver is 5*s.* an ounce it is equivalent to 10 per cent. apparent profit; but as the government is obliged to keep up at its own cost the renewal of the silver coin, the wear and tear of which is considerable, the real profit is trifling. While the English mint is said to be one of the most economical and efficient manufacturing establishments in Great Britain, the loss by the abandonment of the seigniorage is 3*d.* on each sovereign. This free coinage of Charles II., says a recent English writer, "was made partly as a concession to the goldsmiths, and partly under the impression that with a free mint we should attract all the gold of Golconda and Peru to our coffers. Till then it had been the custom of the English government, as it is still the custom of every government but our own, and even of our own government in India and Australia, to levy a seigniorage of 1 per cent. or thereabouts upon the work of the mint." This seigniorage was relinquished by Charles II. in consideration of the house of commons presenting him with the customs duties.—*Mints and Assay Offices in the United States.* Under the coinage act of 1873, which reorganized this branch of the public service, the following mints and assay offices are in operation: the mints of Philadelphia, Pa., San Francisco, Cal., Carson City, Nev., and Denver, Col.; and the assay offices of New York, Charlotte, N. C., and Boise City, Idaho. The mint, by the act of April 2, 1792, was established for the purpose of a national coinage at Philadelphia. The machinery, as well as the metal first used, was imported. Steam power was first introduced in 1816. The first money coined by authority of the United States was copper cents in 1793. In 1794 silver dollars were coined, and in 1795 gold eagles. Branch mints were established in 1835 at New Orleans, La., Charlotte, N. C., and Dahlonega, Ga.; in 1854 at San Francisco, Cal.; and in 1870 at Carson City, Nev. Assay offices were established at New York in 1854, at Denver, Col., in 1864, and at Boise City, Idaho, in 1872. These various establishments were branches of the mint at Philadelphia, and under this organization the coinage was conducted till April 1, 1873, when the new law became operative. This law established the mint and assay offices as a bureau of the treasury department, placed the several institutions upon substantially an equal basis, and brought them all under the general supervision of the chief officer of the bureau. Under this act the officer previously called director of the mint took the title and assumed the duties of the superintendent of the mint at Philadelphia. The bureau of the mint of the United States is in charge of the director of the mint, who is under the general direction of the secretary of the treasury, and is appointed by the president, by and with the advice and consent of the senate, for five years, unless sooner removed by the president for rea-

sons to be communicated by him to the senate. The officers of each mint are a superintendent, an assayer, a melter and refiner, and a coinier, and for the mint of Philadelphia an engraver. The following are the usual forms in which gold bullion is received: lumps, grains, and dust in their native state; amalgam with the quicksilver burned off; foreign coin, United States coin issued before 1834, and United States defaced coin issued since; jewelry, dentists' plate, bars, rings, &c. The following are the usual forms in which silver bullion is received: foreign coin, United States coin issued before 1853, and United States whole dollars and defaced coin issued since; plate, bars, rings, &c.; native lumps and grains in their native state; and, as an accommodation to the holders, the coppery silver of Lake Superior, but it must contain at least one fourth silver. Deposits of bullion, not less than \$100 in value, are receivable by the superintendent, who causes it to be weighed in the presence of the depositor, and gives him a receipt therefor expressing the weight in troy ounces. Each deposit is kept separate during the process of melting and assaying, and until its precise value is determined. This is generally accomplished in three days, when, on presentation of the original receipt, the net proceeds are paid to the depositor or his order. The charge for converting standard gold bullion into coin is one fifth of 1 per cent.; and the charges for converting standard silver into trade dollars, for melting, refining, toughening, &c., are fixed from time to time by the director so as to equal but not to exceed the actual average cost. Deposits of gold are paid in gold, and if the deposit contains the value of over one dollar of silver clear of parting charges, the value of such silver is paid in silver coin. The charges for refining and separating silver from gold vary from one cent to six cents an ounce; for coinage of gold, one half of 1 per cent.; and for making fine gold bars, six cents per \$100 if the deposit contains silver, and if not, five cents an ounce. Deposits of silver are paid in silver. If the silver deposit contains the value of over one dollar in gold, clear of parting charges, the value of such gold is estimated and paid in gold coin. The charges for refining and separating gold from silver vary from one third of one cent to six cents an ounce; for coinage into trade dollars they are 50 cents per 100 pieces; for making fine silver bars, one half cent an ounce on the fine silver. Silver bullion is purchased at 118 cents an ounce (standard fineness nine tenths pure silver), and paid for in silver coin of less denomination than the dollar. Each deposit of gold or silver is melted and cast into bars, being thus brought into a homogeneous state, so that an assay piece taken from it shall fairly represent the mass. The assayer, operating upon a small quantity of the assay piece which he has taken, determines by an exceedingly delicate chemical analysis the proportion of gold or silver or both which it contains. The fineness and the

weight of the deposit after melting are the data for calculating its value. Deliveries of bullion, composed of these various deposits, are made from time to time to the melter and refiner, and are charged to him in account. It is his province to refine them, and convert them into ingots of standard metal, 900 thousandths fine, suitable for the fabrication of coins. Gold and silver in their pure state, on account of their softness, are altogether unadapted for coin. Consequently, each metal is alloyed with a certain quantity of some other metal baser than itself, to give it greater hardness and durability. In the United States silver, in the manufacture of silver coin, is alloyed with copper; the proportion in 1,000 being 900 parts silver and 100 parts copper; and in gold coin, 1,000 parts, 900 being pure gold, 100 alloy of silver and copper, of which not more than 50 parts is allowed by law to be of silver. In practice a very small fraction of this alloy

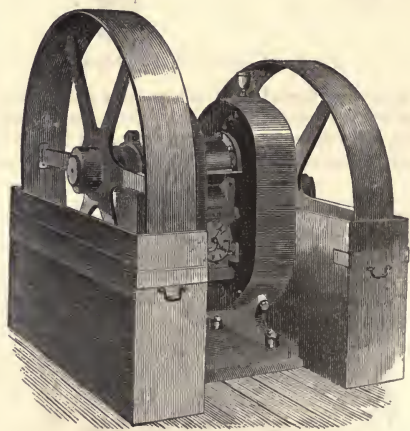


FIG. 4.—Rollers.

is silver. By means of powerful but accurately constructed rollers, driven by steam, the ingots (which are bars sharpened at one end like the blade of a chisel, and about one foot long, three fourths of an inch to two and a half inches broad, and half an inch thick) are rolled into thin strips or ribbons of the proper thickness for the coin to be made, through the rollers exhibited in the drawing (fig. 4) just above the clock dial. This process is required to be gone through ten times for gold and eight times for silver. These strips must occasionally be annealed in furnaces, in order to soften them, before they are drawn, which latter operation is done by means of the drawing bench (fig. 5), in which they are drawn like wire through a steel gauge to make them straight and of uniform thickness. Next comes the cutting press (fig. 6), a vertical steel punch working accurately into a matrix or round hole in a steel plate of the size of the planchet required, and operated rapidly by an eccentric, under which

the strips are fed by hand. The gold planchets are subjected before coining to a careful adjustment by weight. This is done by women, whose delicacy of touch fits them admirably

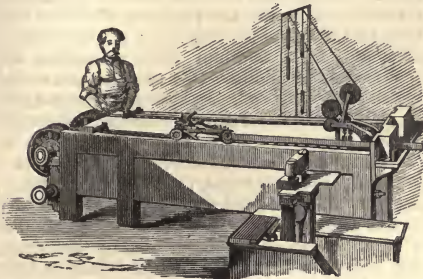


FIG. 5.—Drawing Bench.

for this service. Seated at a long table, each one has a balance before her and a flat file in her hand; and the gold planchets are successively tried against a counter weight. Those that are too light are thrown aside to be remelted, and those that are too heavy are brought to the proper weight by moving the file lightly round the edge. The planchets are now ready



FIG. 6.—Cutting Press.

for the milling machine (fig. 7), an American invention, by which the planchets, as rapidly as they can be fed by hand into a vertical

caused to rotate in a horizontal plane in a channel formed on one side by a revolving wheel, and on the other by a fixed segment of corresponding curve, but slightly nearer the wheel at one end than at the other. The effect is that each piece in passing through this narrowing channel has its edge evenly crowded up into a border or rim. After being annealed and cleaned or "whitened," the planchets are ready for the coining press. The coining press (fig. 8) in use in all the mints of the United States is constructed after the plan of the French lever press invented by Thonnelier. The pressure upon the die is effected by a lever moved by a crank and operating a toggle

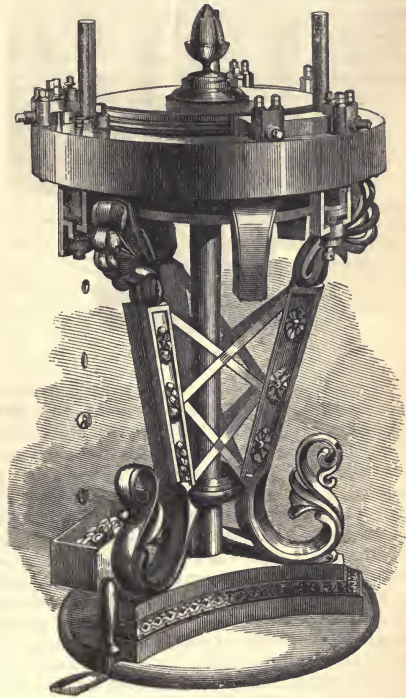


FIG. 7.—Milling Machine.

joint. The planchets being fed by hand into a tube or hopper in front of the machine, the lower piece in the tube is seized by steel feeders and carried forward and lodged in the collar between the upper and lower dies. At the same moment the lever is descending, and by the time the planchet is in position the toggle joint, brought into a vertical position, imparts to the piece a pressure which within the narrow limits of its motion is almost incalculable. The immediate relaxation of the joint causes the upper die to be lifted, when the feeders, coming up with a second planchet, push away the one already coined. The planchet before being struck is slightly less in diameter than

the steel ring or collar into which it drops; but the pressure upon the dies causes the piece to expand into the collar and take from it the reeding or fluting of its edge. The coins, after

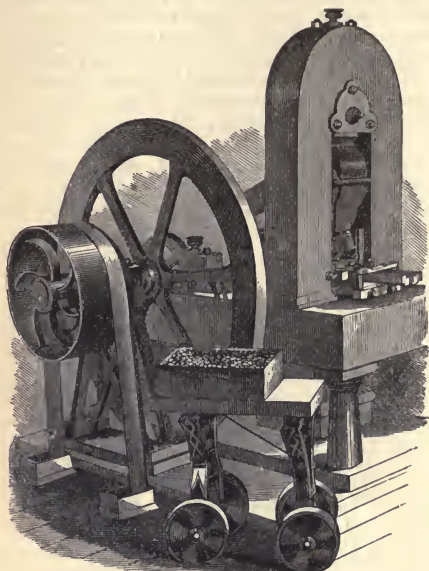


FIG. 8.—Coining Press.

being carefully inspected by the coiner to eliminate defective pieces, are counted and put up in bags, and delivered to the superintendent, by whom the coiner is held to the same accountability as the melter and refiner. The counting is performed with great accuracy and despatch by a counting board of very ingenious construction. The dies used in all the mints of the United States are made under the supervision of the engraver of the Philadelphia mint. The production of original dies cut by the engraver's hand in steel is a work of great labor, and it would be impossible in this manner to supply the dies necessary for the coinage of the country. The original dies, being carefully finished and hardened, are used simply to strike copies in softened steel, which is done by repeated blows under a powerful screw press. As the devices upon the original dies were sunk, these copies will be in relief. To prepare dies for coinage, therefore, this hardening and copying process must be repeated. A rigid system of registration and accountability is necessary to keep the old dies from falling into improper hands.—In the various operations of the mint, particularly in those of the melter and refiner's department, a large amount of precious metals will be temporarily lost by becoming absorbed in the melting pots and fluxes and mixed with the ashes and debris of the furnaces. These materials are carefully gathered up, and the gold and silver extracted

by various methods. The chlorination process of Prof. Miller of the Australian mint, for refining and parting the precious metals, has lately been introduced at the Philadelphia mint. Under the coinage act of 1873, provision is made for the purchase of silver bullion, and the gain arising from its conversion into coin of a nominal value exceeding the cost thereof is credited to a special fund called the silver profit fund. In adjusting the weights of gold coins the following deviations cannot by law be exceeded in any single piece: in the double eagle and the eagle, one half of a grain; in the half eagle, the three-dollar piece, the quarter eagle, and the one-dollar piece, one fourth of a grain; and in weighing a number of pieces together when delivered by the coiner, the deviation from the standard must not exceed $\frac{1}{10}$ of an ounce in \$5,000 in double eagles, eagles, half eagles, or quarter eagles, in 1,000 three-dollar pieces, and in 1,000 one-dollar pieces. In the silver coins the following deviations must not be exceeded: in the dollar, the half dollar, the quarter dollar, and the dime, one and a half grain; and in weighing large numbers of pieces together when delivered by the coiner, the deviations from the standard must not exceed $\frac{1}{10}$ of an ounce in 1,000 dollars, half dollars, or quarter dollars, and $\frac{1}{10}$ of an ounce in 1,000 dimes. In the minor coins no greater deviation is allowed than three grains for the five-cent piece and two grains for the three-cent and one-cent pieces.—During the year ending June 30, 1874, the amount of gold deposits at the mints and assay offices of the United States was \$68,861,595; silver deposits and purchases, \$15,122,151. Deducting the redeposits of bars made and issued by one institution and deposited at another, the deposits were: gold, \$49,142,511; silver, \$11,485,678. The amount in bars transmitted from the New York assay office to the mint at Philadelphia for coinage during the fiscal year was: gold, \$18,704,101; silver, \$2,613,636; total, \$21,317,737. The distribution of the gold and silver bullion deposited and purchased, including receipts, was as follows:

ESTABLISHMENTS.	Gold.	Silver.	Total.
Philadelphia mint....	\$24,586,453	\$3,060,629	\$27,947,252
San Francisco mint....	22,066,151	2,585,008	24,994,759
Carson mint.....	2,219,042	2,575,117	5,088,159
Denver mint.....	962,894	96,969	989,773
New York assay office	18,611,959	6,288,762	24,900,721
Charlotte assay office	8,659	73	8,763
Boise City assay office	112,466	1,792	114,258

—The directors of the mint since its organization have been as follows: David Rittenhouse of Pennsylvania, July, 1792, to July, 1795; Henry De Saussure of South Carolina, July 11 to Oct. 28, 1795; Elias Boudinot of New Jersey, October, 1795, to July, 1805; Robert Patterson of Pennsylvania, July, 1805, to July, 1824; Samuel Moore of Pennsylvania, July, 1824, to July, 1835; Robert M. Patterson of Pennsylvania, July, 1835, to July, 1851; George

N. Eckert of Pennsylvania, July, 1851, to April, 1853; Thomas M. Pettit of Pennsylvania, April to June, 1853; James Ross Snowden of Pennsylvania, June, 1853, to April, 1861; James Pollock of Pennsylvania, April, 1861, to October, 1866; William Milward of Pennsylvania, October, 1866 (not confirmed by the senate); Henry R. Linderman of Pennsylvania, April, 1867, to May, 1869; James Pollock of Pennsylvania, May, 1869, to April, 1873 (date of reorganization, since superintendent at Philadelphia); Henry R. Linderman, April, 1873.—The present mint of France, a very complete and magnificent establishment, where probably the finest work of the kind in the world is done, was built in 1771 and the following years, and commenced work in 1775. In this mint, besides the operations connected with the public coinage and making of medals, the assaying of gold and silver is done for jewellers, who are obliged by law to have every article stamped before it can be sold. The coinage of gold from 1850 to 1872 was of the value of 6,517,507,385 francs, and of silver during the same period 843,821,208 francs.

MINTO, Gilbert Elliot, first earl of, an English statesman, born April 23, 1751, died June 21, 1814. He was the elder son of the third baronet, Sir Gilbert Elliot of Roxburghshire, Scotland, and entered the house of commons in 1774 as a liberal whig. He was ambassador at Copenhagen from 1788 to 1794, and was sent as viceroy to Corsica during the English occupation of that island in the earlier years of the war with the French republic. On his return to England he was raised to the peerage (Oct. 10, 1797) as Baron Minto. In 1799 he was appointed ambassador at Vienna. On resuming his seat in the house of lords, he urged the union of Ireland with England, and subsequently opposed the emancipation of the Irish Catholics. In 1806-7 he was president of the board of control for Indian affairs, and he was governor general of Bengal from 1807 to 1813, when he was made Viscount Melgund and earl of Minto (Feb. 24).—See "Life and Letters of Sir Gilbert Elliot, first Earl of Minto," by his grandniece the countess of Minto (London, 1874).—His son GILBERT ELLIOT-MURRAY-KYNMOUND, second earl, born Nov. 16, 1782, was minister to Berlin in 1832, first lord of the admiralty 1835-41, lord privy seal in the administration of Lord John Russell (his son-in-law) 1846-52, and in 1847 was sent on a special mission to the Italian courts for the purpose of promoting liberal reforms. He died July 31, 1859.

MINUCIUS FELIX, Marcus, a Latin Christian writer, belonging, according to St. Jerome, to the first half of the 3d century. He was a native of Africa, but removed to Rome, and became distinguished as an advocate before his conversion to Christianity. He wrote an apology for Christianity entitled *Octavius*. It is a dialogue defending the Christians from the calumnies then in circulation against them, and

giving much information concerning the manners and customs of the times. It was at one time supposed that *Octavius* formed part of Arnobius's treatise *Adversus Gentes*. Baldwin first published it in an independent form, and assigned it to its real author (Heidelberg, 1560). Editions of the dialogue were published at Leyden in 1709, and at Cambridge, Eng., in 1712; and it has been translated into German by Kusswurm (Hamburg, 1824) and Lübker (Leipsic, 1836), and into English by Richard James (Oxford, 1836).

MINUET (Fr. *menuet*), a graceful and stately dance, which had a celebrity in the last century equal to that at present enjoyed by the quadrille, the waltz, and the polka, but which is now rarely practised except on the stage. It is supposed to have originated in the French province of Poitou, and to have made its appearance in the latter half of the 17th century. The first minuet, said to have been composed by Sully the elder, was danced by Louis XIV. at Versailles in 1653. The name has been derived from *menu*, "little," the steps of the dance being short. The time regulating the movements of the minuet consists of two strains or parts, of eight bars each, in three-crotchet time, both of which from being repeated are called *reprises*.—The minuet or *minuetto* has also been effectively employed by composers as an exclusively musical movement in symphonies, quartets, &c. In this use the two strains consist of 16 bars each, and after being repeated are succeeded by a trio, after which the minuet is again played through somewhat more quickly. The time of this movement, which is of German origin, is an *allegro*, and in the second performance of the minuet it is accelerated to *presto*.

MINUIT, or **Minuists** (properly MINNEWIT), Peter, an American colonial governor, born in Wesel, Germany, in the latter part of the 16th century, died near Fort Christiana, Delaware, in 1641. He was a Protestant deacon in his native town, and on Dec. 19, 1625, was appointed by the Dutch West India company its director general in New Netherland, and landed on Manhattan island May 4, 1626. His first measure was to purchase the island from the aborigines for 60 guilders. He built Fort Amsterdam, and maintained the right of the Dutch against the claims of English supremacy over New Netherland. The colony prospered under his administration, but the West India company held him responsible for abuses which had led to the accumulation of landed property in the hands of the patroons, and he was recalled in August, 1631. He sailed in March, 1632. Stress of weather drove his ship into Plymouth, England, where it was attached at the suit of the council of New England, on a charge of illegally trading within the English dominions. The Dutch ambassador in London protested, but the ship was not released till May 27. Minuit, failing to regain his position under the West India company, offered his

services to the Swedish government in 1637, and toward the close of that year sailed from Gothenburg under the auspices of Oxenstiern, and with a commission from the queen of Sweden authorizing him to plant a new colony on the W. coast of Delaware bay. He anchored in Chesapeake bay in March, 1638, and soon began to build Fort Christiana, 2 m. from the confluence of Minqua's Kill with the South river, near the present site of Wilmington, and despite the opposition of the Dutch he increased the settlement, which he called New Sweden. It was the first permanent European settlement of Delaware, and was annexed to the Dutch possessions in 1655.

MINUTE (Lat. *minutum*), the 60th part of an hour; also used to denote a portion of the arc of a circle, and as a measure of angles. When the circumference of the circle is divided into 24 hours, the minute is $\frac{1}{1440}$ part of the circle. When the circle is divided into 360°, the minute is the 60th part of a degree, consequently equal to $\frac{1}{21600}$ of the circumference. To distinguish these two measures, the former is called a minute of time, the latter a minute of arc; 15 minutes of arc of a parallel of latitude being equal to one minute of time, and 4 minutes of time to a degree.—The term is used in architecture to indicate the 60th part of the diameter of the shaft of a column, measured at the base, and serves as a measure to determine the proportions of the order.

MINUTOLI. I. *Heinrich Menn von*, baron, a German archæologist, born in Geneva, May 12, 1772, died near Lausanne, Sept. 16, 1846. He entered the Prussian army at an early age, was wounded during the campaign on the Rhine in 1793, and made professor in the military school in Berlin. In 1820 he led a scientific expedition to Egypt under the patronage of the Prussian government, and visited Cairo, Thebes, and Asswan, whence he returned to Alexandria, reaching Berlin in August, 1822. The architect Liman, the naturalist Hemprich, and seven of his other companions had died on the journey, and a great portion of his collection was lost by shipwreck. The remainder of it was purchased by the king of Prussia. Minutoli passed his last years in Switzerland. He published *Betrachtungen über die Kriegskunst* (3d ed., Berlin, 1816); a narrative of his travels under the title of *Reise zum Tempel des Jupiter Ammon und nach Oberägypten* (1824-'7); *Beiträge zu einer künftigen Biographie Friedrich Wilhelms III.* (1843); *Militärische Erinnerungen* (1845); and various historical and archæological works.—While in Italy he married in 1820 WOLFRADINE, countess von der Schulenburg, the widow of a Saxon officer, who accompanied him in his travels, and wrote in French an admirable work on Egypt (*Souvenirs d'Égypte*, 2 vols., Paris, 1826; German translation by Gersdorf, Leipsic, 1829).

II. *Julius von*, baron, son of the preceding, born in Berlin in 1805, died near Shiraz, Persia, Nov. 5, 1860. He became well known in 1846

by his discovery of the Polish conspiracy while he was director of police at Posen. In 1851 he was appointed Prussian consul general for Spain and Portugal, and in 1860 ambassador to Persia. He wrote on jurisprudence and Prussian history, and most extensively on Spain and Portugal and the Canary islands. The principal of the latter works are *Altes und Neues aus Spanien* (2 vols., Berlin, 1854), and *Portugal und seine Colonien im Jahre 1854* (2 vols., Stuttgart, 1855).

MIOCENE, in geology, the intermediate of the three epochs of the tertiary or mammalian age, having the eocene below and the pliocene above. The term is derived from Gr. *μειον*, less, and *καινός*, recent, from less than half its species being of living forms. Some geologists make a fourth division, called oligocene, by separating an upper portion of the eocene and uniting it with the lower section of the miocene. The beds of the miocene epoch are of either marine or fresh-water formation. The marine beds cover a large part of the Atlantic border of the United States, belonging to what is known in American geology as the Yorktown period. They are full of fossils, and occur at Gay Head on Martha's Vineyard, in Cumberland co., N. J., on both sides of the Chesapeake in Maryland, and in Virginia at Yorktown, Suffolk, Smithfield, and other places. Fresh-water beds of miocene occur in the upper Missouri region, along the White river, called *mauvaises terres* or "bad lands." They constitute the "White river" group of Hayden, and have a thickness of 1,000 ft. and upward. In these beds are found the remains of the *titanothereium*, which also occurs in the eocene. There are also in the Wind river valley and on the west side of the Wind River mountains other fresh-water deposits from 1,500 to 2,000 ft. thick, called the Wind river group. In California and Oregon the miocene formation consists of sandstone and shale, in some places attaining a thickness of 4,000 or 5,000 ft. They occur near Astoria on the Columbia river, and also in the coast ranges both north and south of San Francisco, in the Santa Inez mountains, and at various other places.

MIOLAN-CARVALHO, Caroline Marie Félix, a French singer, born in Marseilles, Dec. 31, 1831. She studied under Delsarte and subsequently under Duprez at the Paris conservatory, where she obtained the first prize after having appeared in the first act of *Lucia di Lammermoor* and the second act of *La Juive*. In 1850 she won great applause in *L'Ambassadrice* at the Opéra Comique. In 1853 she married M. Léon Carvalho (Carvaille), who became manager of the Théâtre Lyrique, with his wife as the leading prima donna. She performed with brilliant success in London in 1859, as successor of Mme. Bosio. Her chief rôles are Margaret in "Faust," Dinorah, Juliet in "Romeo and Juliet," Zerline in "Don Juan," and Rosine in "The Barber of Seville."

MIOT, André François, count de Melito, a French author, born in Versailles, about 1762, died in Paris, Jan. 5, 1841. He was connected with the ministries of war and foreign affairs and the diplomatic service, and was councillor of state under the empire, minister of war and the interior under Joseph Bonaparte in Naples, and intendant of his court in Madrid. In 1835 he was admitted to the French academy. His principal works are: a translation of Herodotus with a life of Homer attached (3 vols., Paris, 1822); *Bibliothèque historique de Diodore de Sicile*, a translation containing all new fragments of the works of Diodorus (7 vols., 1835-8); and his posthumous *Mémoires sur le consulat, l'empire et le roi Joseph* (3 vols., 1858).

MIQUELON. See SAINT-PIERRE.

MIRABEAU, Gabriel Honoré Riquetti, count de, a French author and statesman, born on his father's estate of Bignon, near Nemours, March 9, 1749, died in Paris, April 2, 1791. A huge-headed infant, who had come into the world with a pair of grinders, one foot twisted, and tongue-tied, disfigured when three years old by confluent smallpox, he grew up "as ugly as the nephew of Satan," but giving signs of bodily strength, passionate temper, and intellectual power. His father was a philanthropist and the author of a work entitled *L'Ami des hommes*, but was a tyrant at home, and tried to subdue his son by severity and contempt. The boy was educated at first by private tutors, and then was entered at a military school in Paris, under the assumed name of Pierre Buffière, because his family were ashamed of him. On July 19, 1767, his father placed him as a volunteer in the Berry regiment of cavalry, under a colonel notorious for his severity. He contracted a few debts, lost 40 louis at the gaming table, and surpassed his colonel in the affections of a young girl at Saintes. These offences brought upon him the wrath of his father, who in the autumn of 1768 banished him by a *lettre de cachet* to the fortress on the isle of Ré. Here he made a friend of his jailer, who reported favorably concerning him, and his father procured him a commission as second lieutenant in the regiment of Lorraine, which was sent to Corsica in 1769. During a year of hard service he evinced such alacrity, courage, and fidelity as to command the esteem of his officers and the affections of his comrades. On his return he was sent to his uncle, the bailli of Mirabeau in Provence, who undertook to conciliate his father. At last Mirabeau was allowed to assume his true title, and was presented at court. By his father's advice he married, June 22, 1772, Marie Émilie de Covet, the only daughter of the marquis of Marnigane. She had no portion, and he soon became involved in pecuniary difficulties. His father not only declined to help him, but prevented the marquis of Marnigane from doing so, and on Aug. 23, 1774, imprisoned him in the castle of If at Marseilles; and when his wife and family prayed for his release, he had

him removed, May 25, 1775, to the fort of Joux, in the Jura mountains. Being allowed occasionally to visit the neighboring town of Pontarlier, Mirabeau fell in love with Sophie, marchioness de Monnier, the young and gifted wife of an old magistrate. In August, 1776, he eloped with her to Verrières, Switzerland. A few weeks later they were in Amsterdam, where Mirabeau, under the fictitious name of Saint-Mathieu, tried to make a living by writing for Dutch publishers. He made some translations from the English, and wrote his *Avis aux Hessois*, a pamphlet against the Hessian sale of soldiers to England for service in the American war. On May 10, 1777, he and his paramour were condemned by the tribunal of Pontarlier, he being sentenced to be beheaded for "forceful abduction and seduction," while she was condemned to imprisonment for life. On May 14 they were arrested and taken to Paris; he was imprisoned at Vincennes, and she was sent to a convent at Gien. His father had resolved to keep him a prisoner for life. In his dungeon he constantly wrote love letters to Sophie (a favor which had been granted to him by the chief of police, as the only means of preventing his suicide), and accomplished a good deal of literary work, the most important part of which was his *Lettres de cachet et prisons d'état*. In spite of the fact that he was attacked by several serious diseases, and was losing his eyesight, his father was deaf to all appeals, until the death of his little grandson suggested the "necessity of perpetuating the family," and Mirabeau regained his liberty Dec. 13, 1780, after an imprisonment of three years and a half. He at once set to work to settle a warfare that had been going on between his parents for many years; but here he failed. His mother was for ever alienated from him; but the success which she obtained in her lawsuit against her husband was followed by a reconciliation between father and son, May 20, 1781. Meanwhile Mirabeau had had an interview with Sophie; but jealousy had sprung up between them; they parted in anger, and in 1789 she committed suicide. An attempt at reconciliation with his wife was unsuccessful, and he resorted to legal proceedings for her recovery. These he conducted himself, with marked ability and eloquence. His pleadings before the parliament of Aix created deep emotion among the people of that city, the majority of whom sided with him; but one half of the judges were relatives of Marnigane, and the court decreed, July 5, 1783, that the wife should remain separated from her husband. Though defeated, Mirabeau became a popular idol. After a futile attempt to appeal the suit, he went to England, where he published his *Considérations sur l'ordre de Cincinnatus*, and his *Doutes sur la liberté de l'Escout*, a defence of the Dutch monopoly against the designs of the emperor Joseph II. He returned to Paris in April, 1785, and wrote several able pamphlets on financial subjects. At the close of this year

he visited Berlin, where he published a pamphlet upon Cagliostro and Lavater, and *Moses Mendelssohn, ou la Réforme politique des Juifs*. After paying a short visit to Paris, he returned with a secret mission from the French ministry. For six months he held a semi-official correspondence, and accumulated materials for a great work upon the Prussian monarchy. In 1787 he returned to France, and wrote a pamphlet, *Dénonciation de l'agiotage*, directed against Calonne, and followed some time after by a similar attack on Necker's policy. Being threatened with another *lettre de cachet*, he went to Brunswick, where he completed his work *De la monarchie prussienne*, which was published the next year (8 vols. 8vo and 4 vols. 4to). With the exception of the few months of his mission to Prussia, he had recently been greatly embarrassed by pecuniary difficulties; but now he found himself in the most wretched situation, and it was probably under the pressure of sheer penury that he published, under the title of *Histoire secrète de la cour de Berlin*, his confidential letters to the French ministry. This publication was ordered to be burned by the executioner. The convocation of the states general being now announced, he went to Provence in the beginning of 1789, and presented himself for election to the nobility of this province; but he soon drew upon himself their implacable hostility by his boldness in the discussions as to the mode of election. He was finally expelled from their assembly, as having no fief of his own, and threw himself into the arms of the third estate. Several times he was called upon by the authorities to exhort the people during riotous disturbances. He was elected to the states general for both Marseilles and Aix, and decided to sit for Aix. In the assembly he never had a party; but by logic and eloquence he swayed it at will on almost every important occasion. He encouraged the third estate to maintain their rights against the pretensions of the other orders, and at the end of the royal sitting of June 23 he sent the grand master of ceremonies back to the king with this bold answer: "Go and tell your master we are here by the power of the people, and that we are only to be driven out by that of the bayonet." But, detesting mob license no less than tyranny, he advocated the royal prerogative of the veto, and, while "utterly opposed to a counter revolution," declared himself ready to make an effort for "the restoration of the king's legitimate authority as the only means of saving France." In consequence of this, part of his debts, about 80,000 francs, were secretly paid by order of the king, and he received a monthly pension of 6,000 francs. He also received four notes of 250,000 francs each; but these were given back to the king at Mirabeau's death. This has been cited as evidence of his venality, though he pursued a line of policy dictated by his convictions. On May 20, 1790, in an elaborate oration, he sup-

ported the king's right to declare peace or war, in opposition to several celebrated orators, and especially Barnave, whose popularity was now more than equal to his own. Barnave was borne in triumph, while Mirabeau was charged with treason and corruption. Three days later he ascended the tribune, defended himself with fervid and convincing eloquence, and came out triumphant. The mass of business which Mirabeau now carried on simultaneously was prodigious. In addition to his duties as a deputy, he published a journal, which, first under the title of *Journal des États Généraux*, then *Lettres à mes Constituants*, and finally *Courrier de Provence*, gave a report of the sittings, and freely discussed all the questions of the day. In these labors he called around him coadjutors, such as Dumont, Duroveray, Reibaz, and others, who not only wrote for his periodical, but assisted him in the preparation of documents, and even of his speeches. But his strength became exhausted by his herculean labors, rendered still more dangerous by high living and licentiousness. On March 27, 1791, though very ill, he occupied his seat in the assembly and spoke five times. When he went home, his friend and physician Cabanis saw that his end was approaching. The news of his illness spread over Paris like a public calamity; the chaussée d'Antin, the street in which he lived, was thronged by the multitude; bulletins were printed and distributed every hour; twice a day the king sent to his house for tidings. After a night of terrific suffering, at the dawn of day he addressed Cabanis: "My friend, I shall die to-day. When one has come to such a juncture, there remains only one thing to be done; that is, to be perfumed, crowned with flowers, and surrounded with music, in order to enter sweetly into that slumber from which there is no awaking." He ordered his bed to be brought near the window, and looked with rapture at the brightness of the sun and the freshness of his garden. His death was mourned by the whole nation; every one felt that the ruling spirit of the revolution had passed away. His body was carried in pomp by the assembly and the people to the church of Ste. Geneviève; but three years later, by order of the convention, it was removed to the churchyard of St. Catherine, the burial place of criminals.—Editions of Mirabeau's works have been published by Barthe (8 vols. 8vo, Paris, 1819-'20), and by Mérilhou (9 vols. 8vo, 1825-'7); but neither of these collections is complete, while their biographical notices are far from correct. Many of his productions have had but one edition, and are now difficult to find. The *Mémoires biographiques, littéraires et politiques de Mirabeau*, by Lucas Montigny, his adopted son (9 vols. 8vo, Paris, 1834-'5), are as yet, in spite of serious defects, the most valuable source of information on the subject. See also *Correspondance entre le comte de Mirabeau et le comte de La Marck pendant les années 1789, 1790 et 1791* (3 vols., Paris, 1851); Dumont's

posthumous *Souvenirs* (1831); Schneidewind's *Mirabeau und seine Zeit* (Leipsic, 1831); "Mirabeau, a Life History" (London, 1848); Vermorel, *Mirabeau, sa vie, ses opinions et ses discours* (5 vols., Paris, 1864-'66); Reynald, *Mirabeau et la constituante* (Paris, 1872); and Loménie, *Mirabeau et son père* (Paris, 1874).

MIRACLE (Lat. *miraculum*, from *mirari*, to wonder), in the stricter usage of the word, a work of divine power, interrupting (or violating) the ordinary course of nature, and directly designed to attest the divine commission of him who works the miracle. In the Scriptures of the Old and New Testament, both the *τέρας*, or *prodigium*, and the *σημεῖον*, or sign of divine power, are included in the general idea of miracle, but not dissociated. In the New Testament these words (*τέρας, δυνάμις, σημεῖον*) are used to express the supernatural acts and occurrences by which the character and mission of Christ and his apostles were declared and attested. The first is the most general and indefinite, properly an extraordinary and portending phenomenon, something monstrous and out of the course of nature. The second is more specific, implying the possession of supernatural power, through which such acts were performed. The third is still more specific, expressing the object of such acts, namely, as signs or indications by which something is made known. Christ says: "The works that I do bear witness of me, that the Father hath sent me." Augustine, *De Civitate Dei*, 21, 8, argues that a miracle is not against nature in its highest aspect: "How is that against nature which comes from the will of God, since the will of such a great Creator is what makes the nature of everything?" Abélard maintained that, in relation to the divine omnipotence, nought is miraculous. Aquinas sharpens the contrast between the miraculous and the natural. The schoolmen set up two criteria of miracles: that they are, 1, above the ordinary course of nature; 2, by the power of God. After the reformation, in connection with the progress of modern philosophy, both physical and metaphysical, the necessity of yet further distinctions and limitations became manifest. Bacon in his "Advancement of Learning" asserts: "There never was a miracle wrought by God to convert an atheist, because the light of nature might have led him to confess a God; but miracles are designed to convert idolaters and the superstitious, who have acknowledged a deity but erred in his adoration; because no light of nature extends to declare the will and worship of God." Spinoza in his *Tractatus Theologico-politicus* led the way in the historical criticism of the Biblical narratives, on the basis of the definition: "A miracle signifies any work the natural cause of which we cannot explain after the example of anything else to which we are accustomed; or, at least, he who writes about or relates the miracle cannot explain it." German rationalism, in its earlier form, attempted the explanation of

the gospel miracles by material and spiritual causes. Some alleged that Jesus had unusual knowledge of the powers of nature, or effected his cures by his spiritual influence over men's souls. Others, as Paulus, explained them by the supposition that the disciples confounded natural events with supernatural; *e. g.*, the two angels in the tomb, clad in white, were an illusion caused by linen garments hanging there; or by such violent interpretations as that the walking upon the sea meant walking on the border of the sea. Some, again, found in them only a symbolical or allegorical sense, and interpreted them as images of spiritual truths. In the mythical theory of Strauss they are denied as facts, and explained, not as wilful deceptions, but as a spontaneous expression of popular religious feeling, ascribing to Christ what is false in fact, but true in some very general philosophical idea. As to the position of miracles in the evidences, some divines, in the reaction against rationalism, have laid the chief stress upon these external signs of divine power, making the miracle to be the main source of an undoubting belief, while others put the truth of the doctrine in the front rank, and made the doctrine the test of the miracle, rather than the miracle the proof of the doctrine. Thus Dr. Wardlaw would test the doctrine by the miracle, while Dean Trench advocates the converse order. But it seems difficult, and even illogical, to construct on this point an absolute dilemma; for, on the one hand, the mind receives spiritual and divine truth on its own evidence, and for its own sake; while, on the other hand, all who are enlisted in this debate allow that miracles have an important position in the external evidences for the Christian faith.—For a full discussion of miracles, see Douglas, "Criterion, or Miracles Examined" (London, 1754); Campbell, "Dissertation on Miracles" (Edinburgh, 1763); Farmer, "Dissertation on the Miracles" (1771); Leland, "View of Deistical Writers" (1798); Schleiermacher, *Der Christliche Glaube* (Berlin, 1821-'2); Strauss, *Das Leben Jesu* (Tübingen, 1835; abridged ed., 1864; English translation, 1865); Tholuck, *Glaubenswürdigkeit der evangelischen Geschichte* (Hamburg, 1837), and on the miracles of Mohammed and those in the Catholic church, in his *Vermischte Schriften* (1839); Leslie, "Truth of Christianity" (1848); Wardlaw, "On Miracles" (1853); W. L. Alexander, "Christ and Christianity" (New York, 1854); N. W. Taylor, "Lectures on Moral Government" (1859); McCosh, "The Supernatural in relation to the Natural" (New York, 1862); Mozley, "Bampton Lectures on Miracles" (London, 1865); G. P. Fisher, "Essays on the Supernatural Origin of Christianity" (New York, 1865); the duke of Argyll, "The Reign of Law" (London, 1866); and "Christianity and Skepticism," the Boston lectures for 1870 (Boston, 1870). On the continuance of miracles in the church, besides the works of Blunt and Bishop Kaye, see Middle-

ton, "Miraculous Powers" (London, 1749; new ed., 1844); J. H. Newman (in reply to Taylor's "Ancient Christianity"), "Essay on Miracles," prefixed to his translation of Fleury's *Histoire ecclésiastique*, and also published separately (1843 and 1873); H. Bushnell, "Nature and the Supernatural" (New York, 1858); and Mountford, "Miracles Past and Present" (Boston, 1870).

MIRACLES AND MORALITIES, religious and allegorical plays, which constituted the drama of the middle ages. They were often called miracle plays and moral plays, and in later times have more frequently been indiscriminately styled mysteries. The subjects of the miracles were either the narratives of the Bible or the legends chiefly of the lives of the saints; and the moralities, which appeared later, intermingled allegory with sacred history, or were represented exclusively by allegorical personages. In the first ages of Christianity baptism was refused to any one concerned with the theatre, and both the Greek and Latin fathers anathematized the dramatic art. In the 4th century the church succeeded in extinguishing the theatre everywhere except in Constantinople, where the genius and the arts of antiquity lingered in decay. This triumph had hardly been accomplished when from the bosom of the church sprang a new drama and spectacle. The emperor Julian ridiculed the asceticism of the church by a law forbidding any Christian to be taught in heathen learning. Apollinaris, presbyter of Laodicea, and his more celebrated son of the same name, bishop of that see (died about 390), were fine classical scholars. The former versified the Pentateuch and the history of Israel, and the latter paraphrased the gospels after the manner of the dialogues of Plato. Soon the sacred ceremonies and commemorations of the Christian faith, in the name of which profane games had been proscribed, were transformed into dramatic representations. Gregory Nazianzen, patriarch of Constantinople, is the reputed author of a play on Christ's passion, and of others of the same kind, written to supersede those of Sophocles and Euripides. The progress of this Christian drama cannot be traced till about the 11th century, when Theophylact of Constantinople introduced the feast of fools, the feast of asses, and other religious pastimes, which were celebrated in churches. To these sports the clergy added the acting of miracle plays, which originally were not only composed by ecclesiastics, but were performed by them in churches and the chapels of monasteries. They were afterward exhibited by companies of tradesmen, each guild sharing the expense and undertaking a portion of the performance; and they served the purpose of amusing the people on public occasions and festivals, while the clergy were at length forbidden by popes and councils to take any part in them. Jugglers and minstrels attended the travelling companies. The stages, either tem-

porary or portable on wheels, usually consisted of three platforms, one above another. On the uppermost sat the *Pater Cælestis*, surrounded by his angels; on the second appeared the saints and glorified men; while living men occupied the lowest. On one side of the stage was a dark, pitchy, flaming cavern, from which issued hideous howlings, as of souls tormented by demons; its occupants were the greatest jesters and buffoons of the company, who frequently ascended upon the stage to act the comic parts. It is probable that miracles were introduced, perhaps by returning pilgrims, from Constantinople into Italy, and thence into France and England. The oldest known are in Latin, but in the 12th and 13th centuries they became common in the modern languages; and with some exceptions there is a general resemblance in subjects, characters, and theatrical machinery between those of different countries. They probably had a common origin, and were introduced about the same date, being communicated from one religious body to another. Three Latin miracles written early in the 12th century by Hilarius, a disciple of Abélard, are extant; the subjects are the raising of Lazarus, the life of St. Nicholas, and the history of Daniel. The miracle of St. Catharine, by Geoffrey, abbot of St. Albans, was performed in Dunstable, England, and in Paris about the same time, and it was then no novelty. Other Latin plays are preserved which seem to have been very popular, both as scholastic exercises among the younger monks, and as popular exhibitions, the greater part of the story being told by pantomime. The mystery of the wise and foolish virgins, in which Latin and Provençal are used alternately, indicates the period of transition to the vernacular languages, and may stand at the beginning of European dramatic literature.—The miracle of the passion was one of the earliest and most wide-spread, and from it the first theatrical company of Paris, established in 1402, was called the brethren of the passion. It embraced the principal events in the life of Christ, was exhibited with splendid pomp, and its representation occupied several days. Among its characters were the three members of the Trinity, angels or archangels, the apostles, devils, and Herod with all his court. The Virgin Mary is a favorite character in French mysteries, and several of them bear the title of *miracles de Notre Dame*. Others are entitled mysteries of the conception, of the nativity, of the resurrection, and of divers events in the legends of the saints and in the narratives of the Old and New Testaments. The splendor of the theatrical decorations and appliances for inspiring terror increased during the 15th century. In one of the Parisian mysteries St. Barbara was hung up by the heels on the stage, and, after uttering her remonstrances, was torn with pincers and scorched with lamps before the audience. In a mystery exhibited at Mentz in 1437, an immense dragon sprang

out of hell, and threw the spectators into consternation by spreading his wings close by them. The mystery of the "Acts of the Apostles" was acted for many successive days in 1541 before the nobility, the clergy, and a large popular assemblage in Paris. The *dramatis personæ* are God the Father, Son, and Holy Ghost, the Virgin and Joseph, archangels, angels, the apostles and disciples, Jewish priests, emperors, philosophers, magicians, Lucifer, Satan, Beelzebub, Belial the attorney general of hell, Cerberus the porter, and a multitude of other personages, amounting altogether to 485. A large number of French miracles exist in manuscript, and many have been printed or reprinted during the present century.—The Germans have numerous miracle plays, two of which cannot be traced in the contemporary productions of other European nations. The subject of the first of these is Dr. Faustus, which represents the life, death, and damnation of a daring libertine. The subject of the second is the canonization of Pope Joan, which was written in 1480 and attained general popularity. It has 25 characters, among which are the devil and his mother Lilis, three good angels, the Virgin Mary, her Son, Pope Basil, four cardinals, a Roman senator, and Death. The scene shifts between earth, hell, purgatory, and heaven. It begins with a council of devils, who agree to tempt Jutta, the heroine, to profane the papacy. She assumes boy's clothes, accompanies a young clerk to the university of Paris, acquires a doctor's degree, goes to Rome, and is made successively cardinal and pope. The Virgin Mary sends an angel to ask Jutta whether she prefers perdition or penance and final pardon. She resolves to repent, but death suddenly seizes upon her soul while she is lying-in, and carries it to the devils in hell. The Virgin again intercedes, and sends an angel from the throne of grace to release her from torment. The play terminates with the magnificent spectacle of her ascension into heaven. Germany was celebrated for its *Fastnachtsspiele*, or carnival plays, in which religious subjects were treated with unbounded license. In one of them, which is extant, Virgil accompanies the shepherds to adore the new-born Christ.—The records of English miracle plays are at least as ancient as those of France or Germany. Their early popularity is attested by Langlande and Chaucer, and subsequently immense crowds assembled with the greatest enthusiasm to witness their performance. They may be traced from the beginning of the 12th century, but whether they were originally in Latin or in Norman French is not certain. Higden, who wrote, translated, or compiled the Chester plays in 1328, is said to have been obliged to visit Rome three times before he could obtain leave to have them acted in the English tongue. The Chester, Coventry, and Towneley mysteries form three great series. As early as 1268 religious dramas were exhibited by the incorpo-

rated trades in Chester, where they continued with some interruptions till 1577. They consist of 24 dramas, which were annually represented from Whit Monday to the following Wednesday. Among the subjects are the fall of Lucifer, performed by the tanners; the creation, by the drapers; the deluge, by the dyers; Abraham, Melchizedek, and Lot, by the barbers and wax chandlers; Moses, Balak, and Balaam, by the hatters and linen drapers; the killing of the innocents, by the goldsmiths; the descent into hell, by the cooks; the ascension, by the tailors; Antichrist, by the dyers; and the day of judgment, by the websters. The sacred dramas of Coventry drew immense multitudes to that city, as well from its central position as from the patronage of royalty. They were performed by the trade companies of Coventry on Corpus Christi day, from 1416 to 1591. The subjects are nearly identical with those of the two other series, but more numerous, the plays being 42 in number. The friars encouraged them as a means of stigmatizing the labors of Wycliffe, branding his Testament as false, anathematizing Scriptural inquiry as heresy, and enlivening the attachment of the people to the "good old customs" of the church. The Towneley mysteries, so named from the family having possession of the manuscripts, belonged according to tradition to the abbey of Widkirk, and are supposed to be the plays written and performed by the Augustinian friars of Woodkirk. Fairs were held there annually on the feast of the Assumption and on the feast of the Nativity of the Blessed Mary, and internal evidence indicates that these were the occasions of their exhibition. The series consists of 32 plays, bearing a near resemblance to those of the Chester and Coventry collections. The artificers and tradesmen of York also annually celebrated a Corpus Christi play, and the same day was similarly observed by the incorporated trades at Newcastle-on-Tyne and several other large towns, and by the parish clerks and gray friars of London. Christmas also was observed in this way in connection with the festivities of the abbot of misrule. At York every trade was obliged to furnish out a pageant to adorn the occasion, and these pageants were 54 in number in 1415. The first part of the miracle of that year, in which God the Father appears creating the heavens, the angels, archangels, Lucifer, and the angels that fell with him, was performed by the tanners. The second part, in which God the Father creates the earth and all which is therein in the space of five days, was represented by the plasterers. The third part, in which God the Father creates Adam and Eve and breathes into them the spirit of life, was played by the card makers. The 54th part, which includes Jesus, Mary, the apostles, four angels with trumpets, four angels with lances and scourges, four good and four bad spirits, and six devils, was performed by the mercers. There are in the Bodleian

library three miracle plays in the Digby manuscripts relating to the conversion of St. Paul, and two manuscripts containing the Cornish plays of the deluge, the passion, and the resurrection. Only a single example of the New-castle mysteries remains, entitled "Noah's Ark, or the Shipwrights' Ancient Play," in which God, an angel, Noah and his wife, and the devil are the characters. According to Malone, the last mystery performed in England was that of Christ's passion in the reign of James I., but other authorities say they were acted in churches, and even on Sunday, as late as the reign of Charles I. They had, however, generally ceased to be written from the time of John Bale (1538). The principal English miracle plays have been published, and no other portion of mediæval literature is so strikingly marked by mingled drollery and solemnity.—From the reign of Henry VI. miracles had been encroached upon and superseded by moral plays or moralities, in which abstract allegorical personages took the place of Scripture characters. The change was gradual. In one of the Coventry miracles the representatives of *Veritas, Justitia, Pax, and Misericordia* appear in the parliament of heaven. Death and the mother of Death were successively added; and as these characters increased, Biblical history fell into the background and was at length eliminated. Moralities reached their highest perfection in the reigns of Henry VII. and Henry VIII., though they subsequently exhibited greater complication and ingenuity. They contained two standing characters, the Devil and the Vice. The former, the leader of the Seven Deadly Sins, was made as hideous as possible, shaggy, bottle-nosed, and with a tail. He entered upon the stage crying "Ho, ho, ho!" and his part consisted largely in roaring when castigated by the Vice. The latter, though represented as "most wicked by design and never good by accident," was chiefly employed in belaboring the Devil. He was generally dressed in a fool's habit, and the character was gradually blended with that of the domestic fool. Moralities were abundant in France and England in the 15th and 16th centuries. The interludes of John Heywood mark the transition in England from them to legitimate tragedy and comedy. In Paris the devout buffoonery of the brethren of the passion gave offence and caused their suppression in 1547, and the company which purchased the Hôtel de Bourgogne was enjoined to abstain from "all mysteries of the passion, or other sacred mysteries." In French the *Moralité bressinguière et tresbonne des blasphemateurs du nom de Dieu* is one of the most celebrated; and in English Skelton's "Magnyfycence," designed to show the vanity of worldly grandeur, in which the characters are Felicity, Liberty, Measure, Adversity, Poverty, Despair, Mischief, Good-hope, Redress, Circumspection, Perseverance, Fancy, Folly, and Crafty-conveyance.—Mysteries are still occasionally performed at sev-

eral places in Europe, the most celebrated being that of Ober-Ammergau, in southern Bavaria, which is represented every tenth year. (See OBER-AMMERGAU.)—See Onésime Le Roy, *Études sur les mystères* (Paris, 1837); Achille Jubinal, *Mystères inédits du quinzième siècle* (2 vols., Paris, 1837); Heinrich Hoffmann, *Fundgruben für Geschichte deutscher Sprache und Literatur* (Breslau, 1830-'37); "The Chester Mysteries" (London, 1818); William Hone, "Ancient Mysteries Described" (1823); Thomas Sharp, "A Dissertation on the Pageants or Dramatic Mysteries anciently Performed at Coventry" (Coventry, 1825); Collier, "History of English Dramatic Poetry" (3 vols., London, 1831); "Ancient Mysteries from the Digby MSS." (Edinburgh, 1835); "The Towneley Mysteries," published for the Surtees society (London, 1836); William Marriott, "A Collection of English Miracle Plays" (Basel, 1838); Thomas Wright, "Early Mysteries, and other Latin Poems of the 12th and 13th Centuries" (London, 1838); Edwin Norris, "The Ancient Cornish Drama" (Oxford, 1859); and H. N. Oxenham, "Ober-Ammergau in 1871" (London, 1871). A large number of the French miracles and moralities have been published separately, among which are *Les blasphemateurs* (1831) and *La vendition de Joseph* (1835), both exact reproductions in form and type of the manuscripts in the national library.

MIRAFLORES, Manuel de Pando, marquis of, a Spanish statesman, born in Madrid, Dec. 24, 1792, died there, March 17, 1872. He was Spanish ambassador at London (1834), at Paris (1838-'40), and at Vienna (1861), was president of the council of ministers in 1846 and 1863, and was seven times president of the senate, resigning in 1868. He wrote several works relating to the political history of his own times, the most important of which is *Memorias para servir á la historia contemporánea de los siete primeros años del reinado de Isabel II.* (2 vols. 8vo, Madrid, 1843-'4).

MIRAGE (Fr., from Lat. *mirari*, to wonder), an appearance of distant objects in the air, as if standing in the sky, or reflected from the surface of water. It is produced by refraction in strata of different densities, decreasing or increasing rapidly, and sometimes by refraction and reflection combined. The appearances are those which have received the general name of unusual refraction. The phenomena of mirage are said to have been first explained by Monge, while accompanying Bonaparte's Egyptian expedition. There are several cases, of which the four following are the most common: 1, the mirage of the desert, which has the appearance of inverted objects, or reflections from the surface of water; 2, that which has the appearance of objects inverted in the air, and which is seen over the surface of water; 3, simple looming, when objects appear to be elevated above their real level, but are not inverted, the appearance usually taking place over the surface of water;

4, a combination of the two preceding, in which there are appearances of objects both erect and inverted. The causes, in many instances, are not easy to assign definitely. The mirage of the desert and the appearance of an inverted image of an object over the surface of water are usually explained as follows. In the first case the aerial strata decrease in density from above downward, in consequence of the cooling of the upper strata from radiation, and the warming of the lower by the hot sand. Let fig. 1, in which the curves are exaggerated, serve for explanation. By referring to the article *LIGHT* it will be seen that in refraction there is a certain angle at which a ray of light, having passed through one medium, on coming to the surface will not pass out of the medium into the next and suffer refraction, but will be totally reflected back into the first medium. This angle is called the critical angle, or angle of total reflection, and varies with different media. Now an effect analogous to this may take place when a ray of light is passing through different strata of air at a very small angle, which at last becomes reduced to a degree or part of a degree which may be called the critical angle. Suppose the aerial strata in fig. 1 to decrease in density from *a* to *d*; a ray

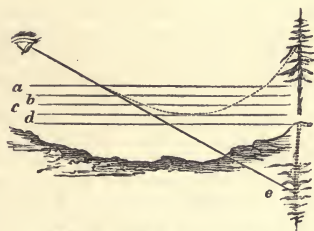


FIG. 1.—Mirage of the Desert.

of light coming from the object will be refracted from the perpendicular in passing downward through the stratum *a*, still more in passing through *b*, and so on until it penetrates a stratum, which we will suppose is *d*, where the critical angle is reached, and the ray becomes totally reflected. The direction of the ray will then be upward, but will be refracted toward the perpendicular as it passes through successive strata of increasing density, so that when the ray reaches the eye the object will appear in the direction of *e*. In the second case, which takes place over the surface of water, and where the lower strata of air are cooled by the water so as to be denser than the upper, the course of the rays is shown in the exaggerated drawing in fig. 2. A vessel which may be so distant as to be partly or entirely hidden by the curvature of the earth, will appear inverted above the horizon when the rays of light are at first refracted from the perpendicular until the critical angle is reached at the stratum *d*, when total reflection takes place, by which the ray is given an inclination down-

ward, so that the object appears in the direction of *e*. Simple looming, in which the object is seen in an erect position, will take place when the rays of light from it reach the eye

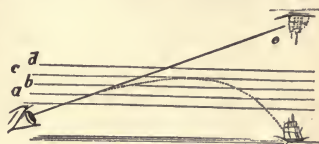


FIG. 2.—Mirage over Water.

before total reflection takes place, or before the critical angle is reached. When the object is seen both in an inverted and erect position, the case is, as has been remarked, a mixed one, and explainable by the examples already given. When the strata are regular, the inverted will be above the erect image; but inequalities sometimes exist which cause, it is said, a contrary appearance, and lateral mirage may sometimes be produced in consequence of strata of different densities lying in a vertical position, as when a stratum of air is heated by a wall which is exposed to the rays of the sun. It is said that on the lake of Geneva boats have been seen doubled from the unequal density of two contiguous columns of air, more or less saturated with moisture, one being on the point of forming a fog. Many remarkable cases of mirage and looming have been recorded. In 1822, in the arctic regions, Captain Scoresby recognized by its inverted image in the air the ship *Fame*, which afterward proved to be at the moment 17 m. beyond the visible horizon of the observer. Dr. Vince, on Aug. 6, 1806, at 7 P. M., saw from Ramsgate, at which place usually only the tops of its towers are visible, the whole of Dover castle, appearing as if lifted and placed bodily on the near side of the intervening hill. So perfect was the illusion, that the hill itself could not be seen through the figure. The phenomenon called *fata Morgana* is a complicated case of mirage. (See *FATA MORGANA*.)

MIRAMICHI, a bay and river of New Brunswick. The bay is about 21 m. long and 20 m. wide at its mouth, Blackland point being on the north and Esquimaux point on the south. It contains Fox and Portage and a number of smaller islands. The river is formed by the junction of two branches about 50 m. from the sea. At its mouth, which is obstructed by a sand bar, are landing places for cargoes, but the chief business places are Newcastle and Chatham, 20 m. up the stream. It is navigable for a distance of 40 m. from its mouth. Great forests of pine cover the banks of the river and the surrounding country. In 1825 a conflagration destroyed the forests on the N. bank and all the towns and villages within an extent of 85 m. long, and in some parts as much as 25 m. broad. The smoke and cinders were seen at Quebec, more than 250 m. distant, and as

far S. as Bermuda. The pines in the burned district have been succeeded principally by poplar, white birch, and maple.

MIRAMON, Miguel, a Mexican soldier, born in the city of Mexico, Sept. 29, 1832, shot at Querétaro, June 19, 1867. He was of French descent. In 1846 he entered the military academy at Chapultepec, and in September, 1847, participated with his classmates in the defence of Molino del Rey and Chapultepec against the Americans. He was wounded and taken prisoner, but after the treaty of peace returned to the academy and completed his studies. Entering the army in 1852, he was often engaged in suppressing local insurrections in the states of Jalisco and Mexico, until in October, 1854, he was sent with the rank of captain in the expedition against Alvarez, who had pronounced for the plan of Ayutla. He distinguished himself in several actions, especially in that of Temajalco, for which he was promoted (July, 1855) to a colonelcy. A few weeks later, on the accession of Alvarez to the presidency, the regular army was placed under the control of its late enemies. This was so irksome to Miramon that in December, being sent as second in command of an expedition against the rebels of Zacapoaxtla, he imprisoned his superior, and with the entire force joined the *pronunciados*, leading them soon after to Puebla, which city submitted without resistance. In the memorable siege of Puebla, March, 1856, Miramon was the soul of the defence; and six months later he again pronounced at Puebla against Comonfort, defending that city a second time for 43 days against 10,000 besiegers. Escaping just before the capitulation, he engaged in a guerilla warfare, capturing Toluca in January, 1857. He was soon after wounded and made prisoner, but escaped in September, rejoined the revolutionists of the south as second in command, seized the town of Cuernavaca, and held it until the outbreak of the final movement against Comonfort headed by Zuloaga. During the fighting in the streets of Mexico in January, 1858, Miramon hastened thither with Osollo, and took by storm the Hospicio and the Acordada, thus deciding the withdrawal of Comonfort and the accession of Zuloaga to the presidency. Miramon was now, at the age of 25, made a brigadier general. Already the idol of the reactionary or church party, he was its most conspicuous leader in the three years' "war of reform" which commenced at this time. In March he gained the battle of Salamanca, which led to the flight of Juarez from the country and the surrender to the conservatives of the chief cities of the interior. He defeated the liberal coalition in the important battles of Ahualulco (September) and Atequiza (December), besides scores of minor engagements. The news of the battle of Atequiza having reached Mexico at a moment when a junta was engaged in the election of a president to succeed Zuloaga, overthrown by the plan of Navi-

dad a few days before, Miramon was chosen, Jan. 2, 1859. He came at once to the capital, but declined the presidency and reinstated Zuloaga. The latter voluntarily retired from office a few days later, appointing Miramon president *ad interim*. Taking possession of the government on Feb. 2, Miramon soon placed himself again at the head of the army, with which he laid siege to Vera Cruz, then the capital of the liberal government of Juarez. Obligated to raise the siege in April, he returned to Mexico in time to witness the battle of Tacubaya, in which Gen. Marquez defeated the forces of Degollado. The execution of the prisoners of Tacubaya, including many non-combatants and several medical students (April 11, 1859), is the chief blot upon the character of Miramon. With alternate successes and reverses, the war of reform was prolonged until the close of 1860, when the decisive battle of Calpulalpam (Dec. 22) opened the gates of Mexico to the liberal army under Gonzalez Ortega, and Miramon was forced to seek safety in flight from the country. In 1862 he attempted to return under cover of the intervention, but was not permitted by the allies to land at Vera Cruz. The succeeding years he passed in Europe. He approved the choice of Maximilian as emperor, but was requested to remain abroad in the nominal discharge of diplomatic functions, in order that his popularity might not embarrass the imperial administration. At the close of 1866, when it was believed that Maximilian was about to resign, Miramon returned to Mexico along with Marquez. As the result of conferences at Orizaba, Maximilian abandoned the intention of abdicating, returned to Mexico, placed Miramon and Marquez at the head of his diminished army, and with them and Mejia undertook the desperate campaign of Querétaro. Captured on May 15, 1867, Miramon was tried and condemned by a military commission, and was shot on the Cerro de las Campanas, along with Maximilian and Mejia. He left a widow and several children, who reside in Austria.

MIRANDA, Francisco, a Venezuelan revolutionist, born in Caracas about 1754, died in prison in Cadiz, Spain, July 14, 1816. He entered the Spanish army at an early age, and at 17 was captain in the Guatemala troops. He was in the French service in the American revolutionary war from 1779 to 1781, and conceived the idea of freeing the South American colonies from Spain. He went to South America in 1783, but his plans were discovered and he fled to Europe. After extensive travels, partly on foot, he then entered the French service as general of division, took part in the campaign of 1792, and in 1793 accompanied Dumouriez to Belgium, where he commanded a division of the army at Neerwinden. He was held responsible for the loss of that battle, and was accused of being implicated in the treason of Dumouriez, and brought before the revolutionary tribunal, but acquitted. He soon

again gave umbrage to the revolutionists, and was compelled to seek refuge in England. In 1803 he returned to France, but was again expelled from the country by the first consul. In 1806 he fitted out an expedition in the United States, enlisting many Americans, and returned to South America, with the view of establishing a republic at Carácas, but was not successful. Toward the close of 1810 he again went to South America, during the disorder of the Spanish government, and maintained himself at the head of an army of insurgents; but he was delivered by Bolívar (July 31, 1812) into the hands of the Spaniards, and carried to Cadiz, where he died after four years' imprisonment.—See "History of Miranda's Attempt to effect a Revolution in South America" (New York, 1808).

MIRANDOLA, Giovanni Pico della, count and prince of Concordia, an Italian scholar, born at Mirandola, Modena, Feb. 24, 1463, died in Florence, Nov. 17, 1494. Almost from childhood he displayed an extraordinary memory. At the age of 14 he was sent to Bologna to study canon law; but he soon went to Ferrara and applied himself to philosophy, theology, and languages, acquiring a knowledge of Latin, Greek, Hebrew, Chaldee, and Arabic, and the different systems of philosophy. After mastering all the learning of the time, he went to Rome in 1486, and propounded there 900 theses as subjects of controversy. His challenge was not accepted, but some of his theses were denounced to Pope Innocent VIII. as heretical; and though he ultimately proved their orthodoxy, he suffered much persecution. These trials induced him to give up the study of profane literature and to devote his attention to religion and philosophy. Resigning his principalities in favor of his nephew, he lived at Florence until his death, a year before which Pope Alexander VI. absolved him of all heresy. A collective edition of his works was published at Bologna in 1496, Venice in 1498, Strasburg in 1504, and Basel in 1557-1601.

MIREEL, Charles François Brisseau de, a French naturalist, born in Paris, March 27, 1776, died near there, Sept. 12, 1854. In 1794 he entered the topographical bureau, but in 1796 fled to the south of France for political reasons. He studied botany at Tarbes under Ramond, and made several botanical tours across the Pyrenees. In 1798 he returned to Paris, and became connected with the museum of natural history. He published some essays in the *Bulletin de la société philomathique*, and in 1800 began a course of botanical lectures at the Athenæum. In 1803 he became superintendent of the gardens and conservatories of Malmaison. In 1806 he went to Holland, when Louis Bonaparte appointed him his private secretary and counsellor of state. He soon returned to Paris, and in 1808 became a member of the institute, and assistant professor of botany and vegetable physiology to the faculty of sciences, and in 1828 professor of

culture in the *jardin des plantes*. His works comprise *Traité d'anatomie et de physiologie végétale* (2 vols. 8vo, Paris, 1802); *Exposition de la théorie de l'organisation végétale* (8vo, Amsterdam, 1808); *Éléments de physiologie végétale et de botanique* (3 vols. 8vo, Paris, 1815). He also wrote 5 of the 18 volumes devoted to the history of plants in Sonnini's *Cours d'histoire naturelle*.—His second wife, **LIZINSKA AIMÉE ZOË RUE**, born in Cherbourg, July 26, 1796, was one of the best miniature portrait painters of her day. She died in Paris, Aug. 31, 1849.

MIRECOURT, a town of France, in the department of Vosges, on the Madon, a tributary of the Moselle, 17 m. N. W. of Épinal; pop. in 1866, 5,735. Nearly the entire male population are engaged in the manufacture of musical instruments, principally violins, guitars, and barrel organs. The town has a communal college, a tribunal of commerce, and a public library of about 7,000 volumes.

MIRÈS, Jules, a French speculator, born of Jewish parentage in Bordeaux, Dec. 9, 1809, died near Marseilles, June 6, 1871. He settled in Paris as a broker, and became director of a gas company. In conjunction with his townsman Moïse Millaud, also a Jew, he purchased in 1848 the *Journal des Chemins de Fer*, which gave them considerable control over railway enterprise; and they increased their influence by purchasing an interest in the *Conseiller du Peuple*, the *Constitutionnel*, and other journals. They next founded the railway bank (*la caisse des chemins de fer*), by which they made several millions. Mirès remained the sole director of this establishment in 1853, and thenceforward was prominent in many loans and industrial enterprises. In 1860 he negotiated a Turkish loan. In February, 1861, he was arrested for maladministration, and sentenced to five years' imprisonment and a fine of 3,000 francs. The imperial tribunal confirmed the sentence, but the court of cassation set it aside and ordered a new trial at Douai, which ended in a reversal of the judgment, and his escaping with one month's imprisonment for an incidental misdemeanor. But when the case was again brought before the court of cassation, the Douai decision was reversed, and Mirès served out his term of imprisonment till 1866. On gaining his liberty, he came forward as a negotiator of loans, and attempted to reorganize his bank; and though the bank of France declined to deal with him, he recovered his influence among his old followers. In 1869 he was involved in a libel suit with Péreire, and in 1870 he was sentenced to six months' imprisonment and 3,000 francs fine for attacking his former judges in his pamphlet *Un crime judiciaire*.

MIRIAM, the sister of Moses, the Hebrew lawgiver. She was present on the bank of the Nile, watching the fate of the infant child Moses, when he was found by the daughter of Pharaoh, and she called her mother Jochebed, the wife of Amram, to nurse him for

the princess. In the Bible she is called "the prophetess;" and after the passage of the Red sea she headed the triumphal procession of women, and led their song of victory. Having together with Aaron spoken against Moses in the desert, on account of his having married an Ethiopian (Cushite) woman, she was struck with leprosy, and was excluded from the camp seven days. According to Josephus, she was the wife of Hur, and grandmother of Bezaleel, the architect of the tabernacle. Her name is the Hebrew form of Mary, and the Arabic traditions confound her with the Virgin Mary. She died in Kadesh.

MIRROR (Fr. *miroir*, from Lat. *mirari*, to wonder, admire), a looking glass or speculum; any bright surface that reflects the rays of light falling upon it. The surface of smooth water is a natural mirror, which the ancient poets sometimes refer to as having been used by persons for viewing their own forms. Metallic mirrors are mentioned in Exod. xxxviii. 8, and Job xxxvii. 18. With the ancient Egyptians one of the principal articles of the toilet was the mirror. Wilkinson says it was of mixed metal, chiefly copper, carefully wrought and highly polished. It was circular, and had an elaborately ornamented handle, the designs of which were sometimes beautiful female figures, and sometimes hideous monsters, whose ugliness contrasted most strongly with the features reflected by its polished surface. The practice of using polished basins for mirrors is alluded to by Artemidorus; and the ancients also had drinking vessels, as mentioned by Pliny, the inside of which was so cut and polished that the image of one drinking from them was reflected many times. The composition of some of the ancient mirrors has been found by William Francis to have been: copper 67·12, tin 24·75, and lead 8·13 parts in 100; and by Klaproth: copper 62, tin 32, and lead 6 per cent. Their manufacture appears to have been most extensively carried on at Brundisium. Pliny gives to Pasiteles, a native of S. Italy and contemporary of Pompey, the credit of introducing mirrors of silver. They are spoken of by Plautus, and in the time of the first emperors they became very common among the Romans, so that they were in use, according to Pliny and Seneca, even by maid servants, and the manufacture of them was one of the important trades of Rome. From several statements of Pliny it appears that various stones were employed as mirrors, set into the walls as panels, and otherwise used to reflect images of objects. Obsidian appears to have been most employed for this purpose. A similar stone called the *itzli*, and by the Spaniards *gallinazo*, was used for the same purpose by the Aztecs, of which hard vitreous stone they also fashioned sword blades and razors. There were other stones of which they made excellent mirrors; but the description of these is too indefinite to determine their names.—Beckmann thinks that

the use of the dark obsidian stone for mirrors suggested the use of glass, that this was attempted at the celebrated glass works of Sidon of which Pliny makes mention, and that they were first made of black glass, and afterward of glass covered on the back with black foil. But from the time of Pliny no certain reference is again found to glass mirrors until the 13th century. In the treatise on optics of Alhazen, the Arabian, of about the year 1000, mention is made of mirrors of iron (steel) and also of silver, but not of glass; and the same thing is remarked of the "Optics" of Vitello, of about the middle of the 13th century. But in the treatise on optics of John Peckham, an English Franciscan monk, who taught at Oxford, Paris, and Rome, and died in 1292, mirrors of iron, steel, and polished marble are spoken of, and also of glass covered on the back with lead. After this time various writers allude to mirrors of this sort, and describe their being made by pouring melted lead over the hot glass plates. In the 14th century glass mirrors were extremely rare in France, while metallic ones were in common use. Beckmann describes the following method of preparing small convex glass mirrors as common in Germany in the beginning of the 16th century: A hollow ball of glass being blown, while it was still hot a metallic mixture of lead or tin and antimony, with a little resin or salt of tartar, was introduced into it, and coated its inner surface, the resin or salt aiding the fusion of the metal and preventing its oxidation. The glass, being entirely coated within, and having become cool, was cut into small round mirrors. It is not many years since they were sold in Germany by the name of *Ochsenaugen*, ox eyes. They were set in a round painted board, and had a very broad border, and reflected a diminished but very clear image. The coating of glass with an amalgam of tin foil and mercury was practised by the Venetians in the 16th century. The process, as described by Porta, who witnessed it at Murano, consisted in spreading the tin foil smoothly upon a plane surface, and pouring upon it mercury, which was rubbed in with the hand or a hare's foot. The amalgam thus formed was then covered with a sheet of paper, and the glass being laid upon this and pressed down, the paper was drawn out. Weights were then laid upon the glass, and it was left for some time for the excess of mercury to drain off. The introduction of this manufacture into France is noticed in the article GLASS. The chief modern improvement in the art consists in the use of very large plates, the process of coating them not differing essentially from that of the Venetians 300 years ago. The present method is as follows: A large stone table, ground perfectly smooth, is so arranged as to be easily canted a little on one side by means of a screw set beneath it. Around the edges of the table is a groove, in which mercury may

flow and drop from one corner into bowls. The table is first made perfectly horizontal, and then tin foil is carefully laid over it, covering a greater space than the glass to be coated. A strip of glass is placed along each of three sides of the foil to prevent the mercury from flowing off. The metal is then poured from ladles upon the foil till it is nearly a quarter of an inch deep, and its tendency to flow is checked by its affinity for the tin foil and the mechanical obstruction of the slips of glass. The plate of glass, cleaned with especial care, is dexterously slid on from the open side, and its advancing edge is kept in the mercury, so that no air or floating oxide of the metal or other impurities can get between the glass and the clean surface of the mercury. When exactly in its place, it is held till one edge of the table has been elevated 10° or 12° and the superfluous mercury has run off. Heavy weights are placed on the glass, and it is left for several hours. It is then turned over and placed upon a frame, the side covered with the amalgam, which adheres to it, being uppermost. In this position the amalgam becomes hard, and the plate can then be set on edge; but for several weeks it is necessary to guard against turning it over, as until the amalgam is thoroughly dried the coating is easily injured.—Several serious difficulties attend this process. The health of the workmen is so affected by the fumes of the mercury that they can rarely follow the business more than a few years; for this no remedy has been found so effectual as thorough ventilation and the frequent use of sulphur baths. The glass plates are liable to be broken by the weights placed upon them; and the coating of amalgam is frequently spoiled by the drops of mercury removing portions of it as they trickle down, or by its crystallizing, or by mechanical abrasion. Many methods of silvering have been contrived and patented with the view of obviating these defects, some of which are important. In 1855 a patent was granted in England to Tony Petitjean for a method of precipitating silver, gold, or platinum upon glass, so as to form a coating upon it, by the use of two solutions, the effect of which when mixed upon the glass is to decompose each other. The solutions he employed were different compounds of ammonio-nitrate of silver, tartaric acid, and distilled water; and they were placed upon the plate while this was at the temperature of 150° F. The precipitated silver within 20 minutes covered the glass, to which it adhered; and the solution being then turned off, all that remained to complete the mirror was to wash the surface, and when dry cover it with a coat of varnish to protect it from injury. The silvering thus obtained is not so white, and is rarely so free from blemishes, as the amalgam coating. In 1849 Mr. Drayton made known a similar method, an improvement upon a process which he patented in 1843. He employed ammonia

1 oz., nitrate of silver 2 oz., water 3 oz., and alcohol 3 oz.; these, being carefully mixed, were all allowed to stand a few hours, when to each ounce of the liquid was added an ounce of saccharine matter, as of grape sugar, dissolved in equal portions of spirit and water. Liebig invented a method of coating glass with silver, in which, after the silver coating is laid on, it is covered with a coating of copper precipitated upon it by the galvanic current, or is protected by varnish. Silver mirrors are now extensively made in New York. For platinizing glass, R. Böttger recommends the following process: Pour rosemary oil upon the dry chloride of platinum in a porcelain dish, and knead it well until all parts are moistened; then rub this up with five times its weight of lavender oil, and leave the liquid a short time to clarify. The objects to be platinized are to be thinly coated with the preparation and afterward heated for a few minutes in a muffle or over a Bunsen burner. The brilliancy of aluminum has caused the suggestion of its application to the coating of mirrors; but no successful experiments have yet been made with it for this purpose. Large mirrors are made in the United States by coating the imported plates. The old amalgamation method with tin foil and mercury is preferred to any of the more recent inventions, by reason of the greater whiteness and brilliancy of the reflection and the greater permanence of the coating.—For telescopes, philosophical instruments, and lighthouses, various sorts of mirrors are in use, and reference to them may be found under various heads in this work, as BURNING GLASS, FRESNEL, LIGHTHOUSE, OPTICS, SPECULUM, TELESCOPE, &c. Concave mirrors serve to concentrate the rays of the sun in one point and produce intense heat.

MIRZAPORE, a town of British India, in the province and 50 m. E. S. E. of the city of Allahabad, and 30 m. W. by S. of Benares, on the right bank of the Ganges; pop. about 80,000. It is the capital of a district containing more than 800,000 inhabitants, is the principal cotton market of the province, and is noted for carpet and cotton manufactures. The town contains fine European residences and many Hindoo temples, the latter mostly situated on the bank of the river. It is of comparatively modern origin.

MISDEMEANOR. Offences less than treason are, in law, divided into felonies (see FELONY) and misdemeanors. Any crime less than a felony is a misdemeanor. Statutes sometimes declare that the offences which they contemplate shall be punishable as misdemeanors, but the term applies equally to all those crimes, whether of commission or omission, for which the law has not provided a name. Misdemeanors are either those which exist at common law, *mala in se*, or they are those which are created by statute, *mala prohibita*. Under the former class, whatever, in the language of Blackstone, mischievously affects the person

or property of another, openly outrages decency, disturbs public order, is injurious to the public morals, or is a corrupt breach of official duty, is indictable as a misdemeanor at common law. Thus it has been held to be an indictable misdemeanor at common law to drive a carriage along the crowded street so as to endanger the lives of foot passengers; to go armed with dangerous and unusual weapons; to disturb a town meeting or a congregation engaged in religious worship. It is an indictable nuisance and scandal to the community to disinter a dead body without lawful authority; to throw a corpse into a river without the rites of Christian burial; to sell knowingly unwholesome provisions; to be guilty of notorious lewdness or drunkenness; to indulge publicly in profane swearing and blasphemy; or, as some authorities hold, to let a house knowing that it is to be used for the purpose of prostitution. So it has been held to be a misdemeanor, indictable at common law, to deposit more than one vote upon a single ballotting; to kill a tree standing upon public ground; to treat an animal with wanton cruelty; to send threatening letters; or to give a challenge to fight.—Misdemeanors which are created by statute are of two kinds. The one kind embraces those which consist in the omission or commission of an act enjoined or forbidden by the statute, though the transgression be not specially made the subject of indictment. For when a statute prohibits a matter of public grievance or commands a matter of public convenience, all infractions of its provisions are indictable, unless this mode of proceeding be positively excluded; because the doing what competent authority forbids, or not doing what it requires, is itself an offence at common law. The second kind includes those statutory offences which are made specially indictable. If the punishment is expressly defined, the provision of the statute must be strictly followed. If the statute merely attaches a new penalty to what was already a common law offence, the remedy may be pursued either as at common law or under the statute.—In respect to misdemeanors, the distinction between principals of the first and second degree is unknown; and those who in treasons and felonies would be accessories after the fact, are themselves liable for the commission of a distinct misdemeanor.—The ordinary punishment of misdemeanor at common law is fine and imprisonment, or either of them, in the discretion of the court; and these are regularly inflicted when no other penalty is prescribed. In Connecticut it has been decided that the fine must be less than the whole value of a man's property, and that the imprisonment must be for a less term than the whole of his life. Finally, in all sentences for misdemeanor, the court may require the defendant to give bonds to keep the peace.—It is inconsistent with the general policy of the law to allow a criminal charge to be referred to

arbitration or to any other mode of private settlement. An agreement to compound a felony has always been held entirely illegal and void. Properly speaking, indeed, the injured party has nothing to compromise. A crime, whatever be the degree of its criminality, is committed against the public order, and it is therefore only upon a public prosecution that the matter can be disposed of. Yet in the slighter offences against the public peace, a compromise, it is said, may be valid. Quoting from Mr. Chitty's notes to the English statutes of arbitration, Mr. Justice Patteson said in an English case, that such penal offences as assault, libel, nuisance, and the like, for which an action of damages would lie, may be submitted to arbitration at common law; and although an indictment has already been preferred, the matter of complaint may still be referred by leave of court. Plainly nothing can prevent an injured individual from submitting to arbitration the private wrong which may be measured and compensated by damages. But the public wrong done, in the slighter misdemeanors even, cannot in strictness be removed from public cognizance except by consent of the proper authority. Hence it seems to be the common law doctrine that though, in such misdemeanors as those just referred to, where the public interest is but little concerned, the criminal process will be waived almost as matter of course upon acknowledgment of private satisfaction, yet express or implied consent of the court to the waiver is still essential to the valid compromise of the matter. This doctrine of the common law is carried out in those statutes by which in several states it is provided, that upon a criminal charge of assault and battery or other misdemeanor, for which a remedy by civil action is given, if the injured party appear before a magistrate and acknowledge that he has received satisfaction, the accused may, or in some cases shall, be discharged on payment of costs.

MISERERE (Lat., have mercy), the name applied in the Roman Catholic church to the 51st psalm, which commences in the Vulgate with that word, and is employed as a penitential hymn at all times, but particularly during Lent. At the end of the office of *Tenebræ* on Wednesday, Thursday, and Friday of Holy Week, the choir chants or recites it kneeling. At Rome, on Good Friday evening, the *Miserere*, set to music by Allegri, is sung with great solemnity in the Sistine chapel. Many other eminent composers have also set it to music.

MISHNAH, or *Mishna* (late Heb., study), the earlier part or text of the Talmud, forming a compendium of decisions, based on oral traditions, respecting the laws and religious rites of the Jews, and first systematically arranged by the patriarch Rabbi Judah the Holy and his school, toward the close of the 2d, or according to others in the first half of the 3d century. It is written in Hebrew, and divided into six

principal parts and 63 treatises. Of the former, the 1st treats chiefly of prayers and the duties of husbandmen; the 2d, festivals; the 3d, marriage relations; the 4th, judicial subjects; the 5th, matters concerning the temple; and the 6th, the institutions respecting purification. For a full analysis of the contents of the Mishnah, see Herzog's *Real Encyclopädie*, article *Talmud*, which also contains an extract from the Talmud, showing the relation of the Mishnah text to the commentaries (*Gemara*) of the early rabbis. Among the numerous separate editions of the Mishnah are those by Surenhuis (6 vols. fol., Amsterdam, 1698-1703, translation and notes in Latin), and by Heinemann and others (6 vols. 4to, Berlin, 1831-'4, with punctuated text, German translation in Hebrew characters, rabbinical commentaries, and brief explanations). A free translation in German, with occasional paraphrase and explanatory notes, was published by Rabe (3 vols. 4to, Onolzbach, 1760-'63). De Sola and Raphael published an English translation of 18 treatises (London, 1843), and Geiger a valuable *Lehr- und Lesebuch zur Sprache der Mishna* (Breslau, 1845).—The Mishnah is a very important aid in the critical study of the New Testament, illustrating many allusions to Jewish usages. But in Christian Europe this body of Jewish learning, of priceless value to Christianity as well as Judaism, narrowly escaped destruction from the fanatical violence of ignorant zealots. Only a few manuscript copies remain. (See HEBREWS, vol. viii., pp. 594-'5, and TALMUD.)

MISKOLCZ, a town of Hungary, capital of the county of Borsod, near the Sajó, and on the railway from Pesh to Kaschau, 90 m. N. E. of Pesh; pop. in 1870, 21,199. It is situated at the foot of a vine-clad mountain called Avas. It is well built, and has five churches, a convent, a synagogue, three gymnasias, a large county house, a theatre, and a fine hospital. The inhabitants, consisting of Magyars, who are the majority, Rascians, Slovaks, Germans, and Jews, are actively engaged in trade and manufactures; the wine trade is important. A large part of the town was destroyed by fire in 1843.

MISSIA. See MEISSEN.

MISSISSAGAS, an Algonquin tribe originally found, in the middle of the 17th century, at the mouth of a river of the same name north of Lake Huron. After the destruction of the Hurons they fled inland, and then moved to Keweenaw on Lake Superior, but returned before 1670 to their old ground. Missions were then attempted among them, but they were strongly attached to their superstitions and to polygamy. They took part in the assassination of the Sioux deputies at Sault Ste. Marie in 1673, which drew on the western Algonquins the fury of that nation. About 1700 they began to treat with the Five Nations, and to move eastward, so that by 1718 they were scattered along the northern line of the lakes from their

old home to the Thousand Islands, most of them being north of Lake Ontario. When the struggle between France and England began, they were the only Canadian tribe whom the English won over through the Six Nations, who adopted them as a seventh nation in 1746. They aided the English in arms, and traded at Oswego; but the English neglected them, and when war again broke out the Mississagas showed little inclination to join them. The mass of the nation were again secured by the French. After the fall of the French power they made a treaty with Col. Bradstreet, but took an active part in Pontiac's war. They were also active in the Miami war against the United States in 1792-'3, and in the hostile movements of the Six Nations in the war of 1812. Their only settlement in the United States was a temporary one at Erie; they are now in the province of Ontario, Dominion of Canada. Missions have been established among them since 1824 by the Methodists and the New England company, and they are improving. They comprise the Mississagas of Mud, Rice, and Scugog lakes, returned in 1869 at 315, and in 1873 at 305. The Rice Lake Indians sold most of their lands in 1818 for an annuity of £740. Those on Scugog lake reside on 600 acres bought by them in 1843. All these bands cultivate the soil and have comfortable houses and chapels. In 1873 the Mississagas at Alnwick numbered 205; they formerly roamed destitute around Quinté bay. The Mississagas of Crédit river, lately removed to the Grand, numbered 215 in 1873. They embraced Christianity and began to improve in 1824 under the exertions of the Rev. Peter Jones, a half-breed.

MISSAL (Lat. *missale*), the mass book of the Roman Catholic church, containing the daily eucharistic service for the whole year. During the first eight centuries the parts to be recited or sung by the bishop or priest, the deacon, subdeacon, and choir, were arranged in separate volumes. The sacramentary, or missal proper, contained what immediately related to the consecration of the eucharist (the sacrament by preëminence), such as the canon, with the prefaces and collects; the evangeliary or deacon's book contained either one of the four gospels, or all four in a volume, or only the passages selected and arranged for daily mass; the lectionary or epistolary contained the lessons from the other portions of the Bible which were sung by the subdeacon; in the antiphonary or gradual were found the anthems, psalms, and hymns chanted by the choir throughout the service; and in the benedictional were the solemn forms of benediction pronounced over the people before communion on the great festivals. St. Jerome, by order of Pope Damasus, collected the four gospels into one volume, with tables indicating the passages for daily use. The deacon's and subdeacon's books soon contained respectively only the tabulated gospels and lessons of the daily mass. The evangeliary in particular was often splendidly illu-

minated, and its rich cover was adorned with precious stones. The most ancient known is that of Vercelli, said to have been entirely written by St. Eusebius, bishop of that city (died about 370).—In the 9th century (see LITURGY) all these separate parts were united in one volume, called plenary missal, the use of which was made obligatory in all churches. The evangelary, lectionary, and antiphony have been continued in separate volumes, for the convenience of the inferior ministers and the choir. The Roman missal consists of three principal parts: 1, the *Proprium Missarum de Tempore*, containing the formularies for the masses of the Sundays; 2, the *Proprium Missarum de Sanctis*, containing special formularies of mass for the festivals of several saints; 3, the *Communione Sanctorum*, containing general formularies for classes of saints (as apostles, martyrs, confessors, &c.), serving as an appendix to the second part for such saints as have no special service assigned them. The *Ordo Missæ*, containing that part of the mass which is invariable, is inserted in the first part of the missal between Saturday of Passion week and Easter. (Concerning the Ambrosian, Mozarabic, and Gallican missals, see LITURGY.) Some dioceses and religious orders have in an appendix special formularies for the masses of certain favorite saints; but the congregation of rites, to which belongs the direction of liturgic matters, discountenances everything that tends to lessen uniformity.—See the Rev. Daniel Rock, *Hierurgia* (2 vols., London, 1833; 2d ed., 1 vol., 1851), and “The Church of our Fathers, as seen in St. Osmond’s Rite for the Cathedral of Salisbury” (3 vols., London, 1849).

MISSAUKEE, a N. central county of the S. peninsula of Michigan, watered by the Manistee and Muskegon rivers; area, 576 sq. m.; pop. in 1870, 130. The surface is rolling and well timbered, and the soil moderately fertile. Capital, Falmouth.

MISSINNIPPI RIVER. See CHURCHILL.

MISSIONS, Foreign. In a theological sense, this term denotes the efforts made by the professors of a religious creed to propagate their doctrines in countries following other religious persuasions. The disciples of Christ received from their master the command: “Go ye into all the world, and preach the gospel to every creature.” In compliance with this call, the apostolic church at once began missionary operations on a larger scale than the world had ever seen before. Unfortunately the records of this first brilliant period of the missionary history of the church have been mostly lost; but enough has been preserved to show that the doctrines of Christianity were taught by the apostles themselves and their disciples far beyond the confines of the Roman empire. Toward the close of the 1st century the heroic missionary efforts of the church had called into existence numerous and flourishing congregations in the towns of Asia Minor, Greece, Italy, the islands of the Mediterranean, northern Africa, India,

and probably several other countries. In the 2d and 3d centuries we see the missionaries successful in parts of southern Germany, Gaul, Arabia, and Ethiopia. Under Constantine Christianity became the state church, and the custom was gradually introduced of using coercive measures for the advancement of the Christian doctrines. The missionary zeal seems not to have abated, but it is frequently difficult for the historian to determine what share the missions and what the secular arm had severally in completing the Christianization of the various countries constituting the Roman empire. At the death of St. Patrick in the latter part of the 5th century Ireland possessed numerous flourishing churches and monastic schools, which became during the next two centuries nurseries of missionaries for Great Britain and continental Europe. Thus from Iona Columba and his companions evangelized Scotland, and his successors sent missionaries and monks to the Hebrides, the Orkneys, and Iceland; while Columbanus and his followers planted monasteries and schools in Gaul, Switzerland, northern Germany, and Lombardy. England, too, as soon as she had been restored to the faith by Augustin, sent missionaries to Germany, to whose labors Boniface gave unity. After him another great Englishman, Alcuin, guided and encouraged in the same direction Liudger and Willehad, who preached successfully to the Saxons and Frisians, and Arno, who was equally successful among the Huns. Under Louis le Débonnaire these missionary efforts were kept up by the schools founded by Boniface at Utrecht and elsewhere. The first seeds of Christianity were then sown in Jutland, the Danish islands, Sweden, and Norway, by Archbishop Ebbo, Ansarius, and others. In the East, Iberia, Armenia, and Persia were the most important missionary fields. After the separation of the eastern church from the western, the interest in the missionary cause almost wholly ceased in the former. The progress of Christianity eastward was arrested, while a considerable portion of its own territory was taken possession of by the Mohammedans. The Nestorians continued for a long time to carry on, especially in China and India, successful missionary operations, of which little is now known. The Latin church continued her spiritual conquests in northern Europe. The Scandinavian kingdoms were finally gained over one after another in the 10th and 11th centuries. Cyril and Methodius opened for Christianity the way to the great Slavic race, by preaching to the Khazars, Bulgarians, and Moravians. Adalbert, bishop of Prague, was martyred in a mission among the Prussians. From Iceland, missionaries accompanied the adventurous Norsemen on their expeditions of discovery; and Greenland is believed to have received from them the first account of Christianity and the first foundation of a Christian church. The extension of Christianity in northern Europe was in some instances procured by

means which churchmen themselves disavowed and condemned. Thus Alcuin openly censured Charlemagne for the oppressive measures by which that emperor compelled the pagan Saxons to receive baptism. This habitual interference of the eastern and western emperors, while it injured the cause it was designed to serve, did not prevent zealous missionaries in every country from risking their lives in preaching to the heathen. The further treatment of the subject may be more conveniently divided under two heads. I. ROMAN CATHOLIC MISSIONS. A new missionary zeal awoke in the Roman Catholic church after the foundation of the mendicant orders, which endeavored to excel each other in extending the territory of their church. Innocent IV. in 1245, and St. Louis in 1248, sent mendicant friars as missionaries among the Mongols; and in 1289 John de Monte Corvino translated the New Testament and Psalms into the Tartar language. Several bishops were appointed for China, where the mission assumed large dimensions, but half a century later it was nearly exterminated. Toward the close of the 14th century the Franciscans supported a flourishing mission in northern Persia, with about 10,000 adherents. The missionaries to the East did not confine their labors to the pagans, but also endeavored to bring about a union of the eastern episcopal denominations, and were partly successful in the case of the Greeks, Armenians, Copts, and others. In the 15th century Portuguese missionaries settled in the islands discovered by their countrymen, and with the aid of the secular arm soon effected the nominal Christianization of Porto Santo and Madeira (1418-'19), of the Azores (1432-'57), and of several districts along the African coast (1486-'97). Very extensive new fields for missions were opened by the discovery of America in 1492, and the circumnavigation of the cape of Good Hope in 1497. Great numbers of missionaries volunteered to be sent to the newly discovered countries, and in the East as well as West Indies missionary operations were commenced on a very large scale. In the East Indies the bishopric of Goa was established in 1520 under Franciscan missionaries, several other bishops for the East were appointed and sent out by the Portuguese government, and a large part of the Christians of St. Thomas were prevailed upon to unite with the Roman Catholic church. In Mexico and Central and South America, the 16th century completed the victory of the Roman Catholic missions, as far as the country was under the dominion of the Spaniards and the Portuguese. In many instances, however, the aid of the inquisition was invoked to suppress the pagan worship.—An extraordinary impulse to missionary labors was given by the establishment of the order of Jesuits. As shortly before a large part of Europe had separated from the Roman Catholic church, they directed their efforts equally to the conversion of the pagans and to inducing the Protestants

and eastern Christians to submit again to the authority of the pope. St. Francis Xavier, who has been canonized as the apostle of the Indies and Japan, surpassed all Christian missionaries who had lived since the apostolic age in the extent of his missionary travels, and in the number of converts whom he baptized. At the time of his death about 100 Jesuits were laboring in the East Indies. Soon after, the east of Asia presented the brightest prospects. But it is particularly in Spanish and Portuguese America that the Jesuit missionaries found a fruitful field. Their first "missions" or Christian parishes along the Paraná and the Uruguay were again and again destroyed by the Mamelucos, who only aimed at reducing the natives to slavery. But having obtained from the home government official decrees declaring the Indian converts to be free men and forbidding the European settlers to molest or hold intercourse with them, a native Christian population of between 100,000 and 200,000 were united under the missionaries, taught the art of agriculture, and governed peacefully for a period of 80 years. A similar result was reached in the mining districts of Peru; while Jesuits, Franciscans, and Dominicans vied with each other in civilizing the wild tribes on the eastern slopes of the Andes and along the head waters and affluents of the Amazon. In New Granada the missionaries were no less active both among the native populations and the numerous African slaves; the most conspicuous among them was the Jesuit Pietro Claver, called "the apostle of Cartagena," who is said to have instructed and baptized upward of 200,000 negro slaves. Prescott, in his "Conquest of Mexico," recounts the enlightened efforts of Cortes to obtain efficient missionaries for the natives. The Augustinians, Franciscans, and Dominicans responded to his call, and did much to civilize and protect the indigenous tribes, while establishing everywhere schools and colleges. Later the labors of the Jesuits in California and New Mexico were attended with the same success as in South America, and their missions were ruined in the last century by the same causes. The Philippines became a Catholic country under the rule of Philip II., and even in the mighty empire of Japan the conversion of a number of princes promised the speedy victory of Christianity, when internal wars and dread of foreign rule called forth (after 1587) a bloody persecution, which ended in the second half of the 17th century in what was thought to be the complete extirpation of Christianity. In China, several Jesuits, especially Ricci and Schall, obtained great influence at the court by means of their astronomical and mathematical knowledge, and among the educated classes of the people by the classic works which they composed in the Chinese language; and this extensive influence was used with great success in gaining converts for their creed. While Spanish missionaries from Mexico were press-

ing northward, the French in 1608 began to send missionaries to North America, and established prosperous settlements among the Abenakis, Hurons, Iroquois, and other Indian tribes. Biard, Brebeuf, Lalemant, and Sébastien Rasle were the most celebrated among those who devoted their whole lives to thoroughly organizing the colonies of native Christians. The French missions gradually advanced up the St. Lawrence and along the lakes. In Abyssinia repeated efforts were made from 1550 to 1634, mostly by Jesuits, to bring the national church, which had been isolated from the rest of the Christian world for more than 1,000 years, into an organic connection with the Roman Catholic church. Several princes entered into their views, and a member of the Jesuit order was appointed patriarch; but at length a successful insurrection thwarted the project. Several other portions of Africa received Catholic missionaries in the course of the 17th century, as Morocco (1630) and Madagascar (1648), but without permanent success. —In the 18th century the Jesuit missions in the East greatly declined. In China and India they were involved in a controversy with the Dominicans respecting certain accommodations to native customs, which the Jesuits regarded as lawful, while the Dominicans stigmatized them as idolatrous. Rome then gave against the Jesuits a decision which has since been cancelled; and from that time the prosperity of their missions declined. In China, moreover, a fierce persecution broke out, which between 1722 and 1754 diminished the number of Christians from 800,000 to 100,000. In Thibet, the Capuchins tried to establish missions, but with only slight success. A larger number of conversions were made in Indo-China, especially in Cochin China and Tonquin, and the Catholic population gradually rose to several hundred thousand, mostly attended by native priests. A firm foundation, amid the continuance of persecution, was also laid in Corea. In Africa a third attempt was made (1750-'54) to unite the Abyssinian church with Rome, but without success. The Portuguese missions on the W. coast of Africa almost entirely decayed. In the Spanish and Portuguese possessions of America the progress of the missions among the Indians was completely arrested by the expulsion of the Jesuits, and the attitude which the governments of Spain and Portugal assumed toward the Roman Catholic church. The French revolution greatly diminished the power and resources of the Roman Catholic church, in consequence of which nearly all the foreign missions declined, while some were given up entirely. Since 1814 the operations in the various missionary fields have again been taken up with renewed zeal; the number of missionary bishops and priests has been greatly increased, but no extraordinary successes have as yet been announced. In China proper, in Corea, and in India, the Catholic population has, however, considerably risen.

Cochin China and Tonquin enjoyed likewise for some time a season of great prosperity, until, about 1857, the persecution to which more or less the Christians were generally exposed assumed such dimensions that nearly all the priests were killed or obliged to flee, and nearly every congregation was scattered. This led in 1858 to an intervention of the French and Spaniards, which terminated in 1862 in the cession to France of three provinces, and in stipulations guaranteeing the free exercise of the Christian religion. Nevertheless the persecution broke out more fiercely than ever in 1868, and four Christian parishes with about 10,000 converts have been blotted out. Japan was reopened to Catholic missionaries in consequence of the treaties of 1858, and was at once occupied as a mission field. In the summer of 1868 a most cruel persecution was begun against the native Christians, especially at Nagasaki and vicinity. The imperial decree recited that the rigorous measures pursued in the 17th century against the Christian religion had not entirely extirpated it, and that of late the number of Christians had considerably increased. Consequently 4,100 persons were taken away from their homes and distributed among 34 daimios, who were to isolate them from their fellow citizens and employ them in the most rigorous penal servitude. The several consuls at Nagasaki and the ministers resident at Tokio protested in vain against the merciless acts of the government. In 1873 the representatives of the Christian powers obtained a promise that the persecution should cease; but 660 persons had in the interval perished in prison. The whole number of native Catholics in Japan was variously estimated in 1873 at from 13,000 to 24,000, with two resident Roman Catholic bishops. The missions in Turkey, and more particularly those among the eastern churches, were in recent times greatly enlarged, and considerable numbers of Armenians, Jacobites, and Nestorians entered into union with Rome. The same step was taken in 1859 by the king of Tigré in Abyssinia, with 50,000 of his subjects. The conquest of Algeria by the French gave rise to some enterprises for the conversion of the Mohammedans, but without notable results. Special missionary associations were formed in Austria for Khartoom in Nubia, and in France for western Africa; but the majority of missionaries were swept away by the deadly climate soon after their arrival at the missionary stations. In North America, the labors among the Indians were taken up again, especially by the Jesuits and Oblates, and the missionaries advanced up to the northernmost settlements in the British possessions. In South America the Jesuits have made repeated attempts at reëntering the fields of their former missionary labors along the Paraná, the Amazon, and their affluents; but their efforts, being looked upon with disfavor by the local authorities, have had but a partial success. In Australasia numerous congregations

of natives have been formed, especially in New Zealand; several smaller islands, as Wallis and Futuna, have been wholly gained for the Roman Catholic church; and, under the patronage of the French, a firm footing has also been obtained in some islands which had been pre-occupied by Protestant missionaries, as Tahiti and the Hawaiian islands.—The Roman Catholic church has a number of institutions for the training of missionaries. The oldest and most celebrated among them is the propaganda in Rome. (See PROPAGANDA.) Other institutions of this kind are Greek, German, English, Irish, Scotch, Belgian, and South American colleges at Rome, and the Chinese college in Naples, founded in the first half of the 18th century by an Italian missionary in China. All the pupils are natives of China, who, after being ordained as priests, return to their country as missionaries. At Verona is a seminary which educates priests for the missions of central Africa; and in connection with this the "African Institute" of Alexandria trains native missionaries. The Greek seminary at Palermo educates priests for the United Greeks. The American college at Rome, for the training of missionary priests for the United States, was opened by Pius IX. in 1859. The seminary of foreign missions at Paris is probably the most fruitful nursery of Roman Catholic missionaries; it supplies a number of the missionary dioceses in China and Indo-China. The college of Old Hallows, near Dublin, Ireland, is of growing importance. The number of its pupils amounts to about 200. It mostly trains priests for Irish emigrants to Protestant countries; but many of them are called upon to preach to the heathen also, especially those in India. Moreover, most of the religious orders educate a number of their members for foreign missions, and some of them have special houses for this purpose. A number of missionary dioceses in pagan countries are intrusted by the propaganda to the several orders, which engage to send there the necessary number of missionaries. Those most numerously represented in the foreign mission field are the Jesuits, Franciscans, Dominicans, Lazarists, the Picpus society, the Marists, Capuchins, and Carmelites. There are also supported in the missions a number of seminaries for the training of a native clergy, of which that at Penang in British Asia is one of the largest.—The first general association for the support of Catholic missions was formed at Lyons, France, in 1822, under the name of the "Society for the Propagation of the Faith." The society gradually extended over nearly all countries of the globe. Its members pledge themselves to pay one sou a week. Its total receipts in 1873 amounted to 5,629,375 francs. It publishes a bi-monthly periodical, the "Annals of the Propagation of the Faith," of which more than 200,000 copies are issued in French, German, English, Italian, Spanish, Portuguese, Dutch, Flemish, and Polish languages. The society contributes to the

support of all Roman Catholic missions. An important auxiliary to this society is the "Association of the Holy Childhood of Jesus," a children's missionary society, founded in Paris in 1844, for baptizing and rescuing pagan children of China, and, if possible, for providing a Christian education for them. Its annual receipts amount to about 1,500,000 francs. The Leopoldine association in Austria, and the Louis association of Bavaria, support almost exclusively missions among the German emigrants in North America. The St. Mary's association of Austria was established for the sole support of the Austrian missions in Khartoom. France has special associations for the support of the missions in western Africa, for the foundation of Christian schools in Turkish Asia, and for missions among the Mohammedans.—The principal Roman Catholic missionary fields in pagan countries at present are: China, with a bishopric in the Portuguese possessions, 22 vicariates apostolic, 3 prefectures apostolic, and a native Catholic population estimated at 700,000; Anam, said to have 7 vicariates apostolic, 53 European and 205 native priests, with 1,280,000 Christians; and India and Ceylon, which have, besides an archbishop at Goa and 3 bishops for the Portuguese possessions, 20 vicars apostolic, and a population of 147,000, of which only a very small portion are English, Irish, French, and Portuguese Catholics, the others being natives. The Roman Catholic population of Africa live mostly in the Portuguese, French, English, and Spanish possessions. The most important missions among the pagans are carried on in and near the French possessions in Senegambia, in Natal, and in the country of the Gallas in central Africa. In Polynesia there are 7 vicariates apostolic for the native population. New Zealand is reported to have 5,000 native Roman Catholics, and the Hawaiian islands still more. The membership of the church among the Indians of North America amounts to several thousands, and is constantly increasing.—See Lockman, "Travels of the Jesuits into various parts of the World" (2 vols., London, 1762); *Lettres édi-fiantes et curieuses* (26 vols., Paris, 1780-'88); W. J. Kip, "Jesuit Missions in North America" (New York, 1846); De Smet, "Oregon Missions" (1847); Huc, "Christianity in China, Tartary, and Thibet" (2 vols., London, 1853); J. G. Shea, "History of Catholic Missions among the Indian Tribes of the United States" (New York, 1855); *Relations des Jésuites* (3 vols., Quebec, 1858); Marshall, "History of Missions" (2 vols., London and New York); and *Annales de la propagation de la foi* since 1822. II. PROTESTANT MISSIONS. The reformers were not indifferent to the duty of giving the gospel to the heathen. Luther took frequent opportunity to remind the Christians of the "misery of pagans and Turks," and to exhort to prayers for them, and to the sending of missionaries to them. While the Protestant church was itself struggling for an existence,

however, the time was not auspicious for inaugurating extensive missionary operations. Yet a beginning was made in 1555. Villegagnon, a knight of Malta, under the patronage of Henry II. of France, began the formation of a French colony in Brazil, and, on the promise that the reformed religion should be taught there, 14 spiritual teachers were furnished by Calvin. On landing in 1556, they immediately set themselves to work in the organization of the future church, but their efforts were soon arrested, as Villegagnon demanded and obtained their return to France. Some evangelical princes showed a great interest in the cause. Gustavus Vasa of Sweden, in whose dominion paganism still existed among the Lapps, founded a mission in their country, which was vigorously supported by some of his successors, especially by Charles IX. Many of the German princes, as Duke Christopher of Württemberg and Duke Ernest the Pious of Saxe-Gotha, made great efforts to awaken an interest in the missionary cause. In 1664 a German baron, Ernst von Wels, published two pamphlets in order to awaken a greater interest in foreign missions, and proposed the formation of a "Jesus Association" for the propagation of Christianity among the pagans. But few German theologians supported him, and the majority called him a fanatic and heretic. Wels went to Holland, where he was ordained as a minister, and then set out as a missionary to Surinam, where he soon fell a victim to his zealous labors. About this time three Protestant nations, the Dutch, English, and Danes, began to wrest from the Spaniards and Portuguese many of their transmarine possessions, and thus to open to Protestant missionaries a vast field of labor. The Dutch founded a number of colonies in the Molucca islands, Ceylon, and Sumatra, and displayed a great zeal in gaining the natives for the Reformed church. The motives and means of these missionary efforts were not always pure; thus, the governor of Ceylon declared that only those natives would get any kind of employment from the government who would sign the Helvetic confession. This declaration induced thousands to demand baptism, which was generally refused to none who were able to recite the Lord's Prayer and the Ten Commandments. At the close of the 17th century about 300,000 Cingalese had been baptized. There were, however, many devoted missionaries, who earnestly labored to spread a spiritual Christianity. The learned Walæus of Leyden advocated the formation of a missionary seminary, and the Dutch East India company cordially approved of the scheme, the execution of which proved eminently useful to the cause of reformed religion.—The early settlers of New England (1620) took a deep interest in the welfare of the pagan Indians around them. The settlement of the country was undertaken partly as a missionary enterprise. Indeed, this

was embodied in the Massachusetts charter, as "the principal end of the plantation;" and the seal of the colony had for its device the figure of an Indian, with the words of the Macedonian entreaty, "Come over and help us." In 1646 the Massachusetts legislature passed an act for the encouragement of Christian missions among the Indians, and in the same year the celebrated John Eliot, "the apostle of the Indians," began his labors among them. The first Bible printed in America was that which he translated for the aborigines. A few copies of that Bible are still in existence, but no living Indian can read it. But Eliot was not the first to preach the gospel to the natives. Thomas Mayhew began his labors among them on Martha's Vineyard in 1643, and soon numbered 300 converts. Five successive generations of the Mayhews continued these labors. In 1674 the Indians of the district were about 3,000, half of them professing Christianity; but in 1792 they numbered only 440. The Rev. John Sergeant and Jonathan Edwards did like missionary service among the Stockbridge Indians in western Massachusetts, and David Brainerd among the Delawares of eastern New York and New Jersey.—A vast scheme of uniting all the Protestant churches of the world into one great missionary society was conceived by Cromwell. He intended to establish a Protestant college for the defence and propagation of the evangelical faith, which was to consist of seven directors and four secretaries, and to receive from the state a fixed annual support. The whole earth was divided into four missionary provinces, each of which was to have its representative in the college. Though this scheme was not carried through, it prepared the English nation for an active support of the missionary societies which soon after sprang into existence. The formation of the first great missionary society of the Protestant world took place at the beginning of the 18th century. Some members of a "Society for promoting Christian Knowledge," which had been founded in 1698, constituted themselves in 1701 a committee for sending missionaries to the pagans. They assumed the name of "Society for the Propagation of the Gospel in Foreign Parts," and the new association was sanctioned by William III. The original design was the formation of colonial churches, and mostly for this purpose the operations have been extended to the East and West Indies, southern Africa, the Seychelles, Australia, Tasmania, and New Zealand. In 1873 it had 484 ordained missionaries, including 45 native clergy in India, 822 teachers and catechists, 141 students in colleges abroad, and an income of £110,259. It is under the control of the church of England, and the influence of the "high church" school at present prevails in its management. The "Scottish Society for propagating Christian Knowledge," founded in 1709, labored for some years among the North American Indians, but without per-

manent success.—Denmark, though it had begun in 1620 to found colonies in the East and West Indies, made no missionary exertions in behalf of the pagans until the reign of Frederick IV., who in 1711 established an annual appropriation of 2,000 rix dollars for missionary purposes, and in 1714 organized the royal college of missions. Unable to find the proper persons for foreign missions in Denmark, the government entered into arrangements with A. H. Francke, who furnished the first men, Ziegenbalg and Plutsch, for establishing a mission in Tranquebar. The society afterward extended their Indian missions considerably, though Denmark took very little interest in them. Most of the missionaries, among whom Christian Friedrich Schwartz shone forth as a model, came from Germany, and the expenses for the missions in the territories of the East India company were mostly defrayed by the London society for promoting Christian knowledge. In 1835 the chief missions of this body were transferred to the society for the propagation of the gospel; and in 1845, when the last Danish possessions in India were transferred to Great Britain, the labors of the college of missions there ceased altogether. The impulse given by King Frederick IV. to the missionary cause called into existence two other remarkable enterprises. The one was a mission in Greenland, commenced in 1721 by a Norwegian pastor, Hans Egede; the other a new mission to Lapland, undertaken by the Norwegian Thomas von Westen. Both were conducted with great zeal and self-sacrifice. Egede induced the king to establish at Copenhagen a seminary, which trained catechists and missionaries for the Greenlanders, until the mission was wholly committed to the Moravians. It was in Copenhagen also that Count Zinzendorf received his first impulse toward spreading the gospel. On his return to Herrnhut the Moravians engaged at once in the cause with a zeal unprecedented in the history of Protestantism. The support of foreign missions was for the first time officially declared to be a duty of the entire church, and an official board was intrusted with the charge of it. The guiding principles of the Moravians were to await a special call from God before going to any part of the pagan world, to avoid as much as possible selecting missionary fields preoccupied by others, and to give the preference to those countries which were among the most abandoned, difficult, and miserable. All the missionaries gained a part or the whole of their support by mechanical or agricultural labor; and the congregations of natives, which were all organized after the model of the church at home, were likewise bound to contribute for missionary purposes. Thus their enterprises stand forth as a great success. The fields which they occupied in succession were the Danish West India islands (1732), Greenland (1733), North American Indians (1734), Surinam (1735), South Africa (1736, renewed

in 1792), Jamaica (1754), Antigua (1756), Barbadoes (1765), Labrador (1770), St. Kitts (1775), Tobago (1790, renewed in 1827), the Mosquito coast (1848), Australia (1849), and Thibet (1853). In 1873 they reported in all 90 stations, 322 missionary "agents," 1,427 native helpers, 21,969 communicants, and an income of £18,017. One out of every 50 of its communicants is engaged in mission service, with three times as many members in its mission churches as in those at home.—There is a great gap in the history of Protestant missions from 1732 to 1792. No new society was formed, and no efforts were made for the propagation of Christianity except by the few agencies above mentioned. Toward the close of the 18th century there arose a widespread dissatisfaction with the results of the rationalistic intellectualism of the day, and a powerful counter-current led vast numbers back to a belief in the supreme necessity of experimental religion and personal piety. At the same time, members of different communions longed to find ways of working together for a common Christianity, in spite of denominational differences. The first foreign missionary society born of this movement was the Baptist of England, established in 1792. The effect of this example throughout Christendom was unparalleled. Other societies arose in England and America, until almost every religious denomination had its own. Money was freely given, missionaries were sent abroad, and converts from paganism were multiplied. In continental Europe the interest in the missionary cause developed more slowly, but has attained considerable proportions. Brief sketches of the most important Protestant missionary societies follow, arranged according to nationality. 1. *British Societies.* The Baptist society, already named, was the first, organized October 2, 1792, under the lead of William Carey, who was also its first missionary. He went to India in 1793, and Serampore soon became the centre of successful and extensive missionary operations. A controversy between the Serampore mission and the parent society brought on a separation lasting ten years, during which the two societies acted independently, but it did not arrest the progress of the mission. The Bible entire or in parts was issued from the Serampore press in 27 different versions, and the school operations were singularly prosperous. Among the missionaries, Marshman and Ward were especially distinguished. Besides India, the West Indies, western Africa, and France received missionaries from the Baptist society. In the West Indies, the churches in Jamaica separated from the home society in 1842, and charged themselves with the maintenance of the mission. In western Africa, the missionaries were expelled in 1858 by the Spanish government from the island of Fernando Po, and their missions forcibly suppressed. The society now has missions in France, Norway, Italy, western Africa, India, China, and the

West Indies, with 423 stations, 87 missionaries, 229 native pastors and preachers, 32,444 communicants, 280 teachers, 12,101 scholars, and an income of £40,255. The General or Arminian Baptists formed a separate society in 1816, and began a mission at Orissa, India, in 1822, and at Ningpo, China, in 1845. In 1873 they had 8 stations in India, 7 missionaries, 15 native preachers, 731 communicants, and an income of £14,216, much of which is raised in India where the work is done. The mission in Ningpo has ceased after a feeble existence, and one has been commenced in Rome.—The "London Missionary Society" owed its origin to a spirited paper in the "Evangelical Magazine," advocating the formation of a missionary society on the broadest possible basis. An invitation for that purpose was signed by 18 Independent, 7 Presbyterian, 3 Wesleyan, and 3 Episcopal clergymen; and the constitutive assembly took place Sept. 22, 1795, in a chapel of the countess of Huntingdon. The islands of the Pacific were selected as the first missionary field, and 29 young men were selected from the large number of those who had offered themselves. On March 4, 1797, the missionaries landed on Tahiti and opened the first mission of the London society. Soon the society occupied also China and the East Indies, where Morrison and Milne prepared a translation of the Bible into Chinese, the islands of the Indian archipelago and Mauritius, southern Africa, the West Indies, Guiana, and North America. Their most important stations are at present those in the South seas, where John Williams labored so nobly and successfully, in southern Africa, where Moffat and Livingstone distinguished themselves, and in Madagascar. In 1873 the society had 156 ordained missionaries, 175 native ordained ministers, 4,006 native preachers, 97,967 communicants, 2,601 schools, 72,289 pupils, and an income of £115,909, of which about £21,950 was from English and native contributions in the mission fields. The society still adheres to its original basis, avoiding denominational differences of doctrine and church government; but the subsequent organization of separate denominational societies has left the London society mostly in the hands of the Independents.—The "Church Missionary Society" was organized April 12, 1799, by distinguished men belonging to the evangelical school of the established church, among whom William Wilberforce, Charles Simeon, and others took an active part. Its progress was slow at first; no missionaries could be found for it in England, and it employed only Germans. Its first mission on the west coast of Africa was unsuccessful, in consequence of the deleterious climate and the plots of the slave traders; but after 1818 mission labors were very prosperous in Sierra Leone. In 1814 the society had stations also in India and New Zealand; in 1822 in Rupert's Land, North America; in 1826 in the West Indies; in 1844 in China; and in

1857 on the banks of the Niger. In 1873 it had 157 mission stations, 207 European missionaries, 147 native clergy, 2,278 catechists and teachers, 22,555 communicants, and 45,782 scholars, not counting 4,356 communicants and 12,866 scholars recently transferred to the native church of Sierra Leone. The income of the society for 1873 reached the extraordinary sum of £261,221, nearly £100,000 above its usual receipts. The president of the society must always be elected from among the members of parliament. Vice presidents are, according to a resolution of 1841, all the bishops of the Anglican church. Since 1825 the society has owned a missionary institute at Islington, which has room for 50 students, and generally counts about 30. The low church party of the establishment has always had a decided control over this society; yet all its missionaries have to submit to episcopal ordination and to subscribe the thirty-nine articles; even the Germans who are employed by the society are now no longer exempt from the latter condition.—The first missions of the Wesleyan Methodists were commenced in 1786, when Dr. Thomas Coke, with three other missionaries, went to the West Indies. After the death of Wesley, Coke remained at the head of the Wesleyan missions, and crossed the Atlantic for missionary purposes no fewer than 18 times. Within 20 years the number of Methodist missionaries in the West Indies and North America rose to 43. In 1813 Coke embarked with five companions for the East Indies, but died before that country was reached. His companions founded a mission in Ceylon, which soon spread to the mainland of India. As long as Coke lived, the administration of foreign missions lay almost exclusively in his hands, under the advice of a committee consisting of all the resident Wesleyan ministers of London; but after his death the necessity of a more complete organization was felt. The "Wesleyan Missionary Society" was constituted in 1817, and soon took a foremost rank among such agencies. It has missions in Italy, Spain, Portugal, Africa, India, China, Australia, Polynesia, and the West India islands. But much the larger part of this society's work is in nominally Christian lands, or in British dependencies and among English colonists. Even in Africa and India its labors are much among English-speaking people; but its most successful missions are among the negroes of the West Indies and among the heathen and cannibals of the Feejee and Friendly islands. In 1873 it had in all 847 stations, 6,647 chapels and other preaching places, 1,125 ministers and assistant missionaries, 4,783 other paid agents, 170,360 communicants, 15,616 probationers, 245,733 pupils, and an income of £167,993.—Besides these larger societies, there are a number of smaller ones, as the Welsh Calvinistic Methodist, founded in 1840; the English Presbyterian, 1844; the "Turkish Missions Aid Society;" and the New Connection Methodists'

foreign mission, commenced in China in 1859.—A "Scotch Missionary Society" was organized at Edinburgh in 1796, and sent the first missionaries among the Tartars near the Black and Caspian seas. After the suppression of all the Protestant missions in those regions by the Russian government in 1833, the association directed its efforts to western Asia and the West Indies. More recently the society has confined its labors to Jamaica. The established church of Scotland, at its general assembly of 1796, rejected as a folly a motion to send missionaries among the pagans; but in 1824 a similar motion was entertained and carried. It was not however till 1829 that its first missionary, Dr. Duff, was sent out to Calcutta. In 1843, when a large portion of the ministers and laity left the established church of Scotland, and organized the Free church, all the missionaries joined the latter. The missionary cause greatly gained by this separation, for the established church sent out new missionaries to carry on the work, and both churches henceforth tried to excel each other in zeal. The church of Scotland has four missionaries in India (one at Calcutta, one at Madras, one at Sealkote, and one at Darjeeling), and a mission at Bombay, superintended by a European teacher, and an income of £10,000. The Free church of Scotland has missions also in India, south Africa, Australia, and Syria, with 45 European and 196 native laborers, 2,163 communicants, 11,086 scholars, and an income of £19,959. It is also engaged in mission work among the Jews, having one of its important centres at Constantinople, with an imposing mission house, embracing chapel and school rooms and about 200 scholars. The United Presbyterian church of Scotland has missions in the West Indies, Spain, Old Calabar, south Africa, India, and China, with 54 stations, 138 out stations, 48 European missionaries, 8 medical missionaries, 8 native preachers, 6,927 communicants, 9,183 scholars, and an income of £38,000. The Presbyterian church of Ireland has 7 missionaries in India, with 138 communicants and 1,199 scholars, and one missionary in China, and an income of £6,371.—Among the other societies established by Great Britain and its colonies are: the Glasgow missionary society, in 1796; the United Secession church's foreign mission, 1835; the Glasgow African mission society, 1837; the Edinburgh medical missionary society, 1841; the Reformed Presbyterian church's foreign mission, 1842; the Loo Choo naval mission, 1843; the Patagonian mission, 1844; the Chinese evangelization society, 1850; and the Chinese society for furthering the gospel, 1850. One of the most useful societies at work in India is the "Christian Vernacular Education Society," with 3 training institutions, 209 native teachers, and 7,000 children in Christian schools. The society has printed 4,000,000 copies of various publications, in 14 different languages, and has 27 depots for the sale of books with 60 colporteurs at work. There is also a

"China Inland Mission," which is hardly an organized body, as it consists only of volunteers who go forth independently and with no pledge of support from any society. They are from England, mostly uneducated, and are endeavoring, as their name imports, to carry the gospel to the interior cities of China. There are 31 such laborers, male and female, with 50 native assistants, occupying 30 stations. They adopt the costume of the country, and find their living among the people, but so far their mission is not eminently successful.—2. *America*. In the United States attention was early called to the necessity of missionary efforts among the Indians and negroes. The first general foreign missionary society was founded under the name of the "American Board of Commissioners for Foreign Missions" in 1810. It owed its origin to a society of students of Andover theological seminary, among whom was Adoniram Judson, whose object was to investigate the best ways and means of making the gospel known to pagan nations. After the model of the London society, they adopted no denominational basis; but the society soon became prominently the organ of the Congregationalists and some of the Presbyterian churches. One of the latter, the Reformed (Dutch) church, separated in 1857, and organized a denominational board, which now has three missions (one at Arcot in India, one at Amoy, China, and one at Yokohama, Japan), with 11 stations, 61 out stations, 13 missionaries, 153 other laborers, 1,323 communicants, 1,022 scholars, 3 medical dispensaries, in which 12,283 patients were treated in 1873, an income of \$55,352, and an expenditure of \$68,106. The "New School" branch of the Presbyterian church continued to cooperate with the American board till 1870, when, upon the reunion of the two branches of the northern Presbyterian church, most of its churches withdrew and gave their support to the Presbyterian board, taking with them, by an amicable transfer, the missions in Syria, Persia, west Africa, and that to the Seneca Indians of New York. The American board now has missions in India, China, Japan, south Africa, Turkey, Austria, Spain, Mexico, the Hawaiian islands, the Micronesian islands, and among the Indians of our own country. Its success in the Hawaiian islands has been most remarkable, the board numbering at one time more than 22,000 members in its churches. It has 19 missions, 72 stations, 497 out stations, 151 missionaries, 222 churches, 10,604 communicants (not including some 12,000 in the Hawaiian islands), 12 training schools or theological seminaries, 21 boarding schools for girls, 551 common schools, 20,490 scholars, an income of \$469,000, and an expenditure (1873-'4) of \$482,000.—"The American Baptist Missionary Union" was founded in 1814, and like some others does not confine its operations to heathen lands, having missions in Germany, Sweden, France, Spain, Greece, Africa, Burmah, Assam, India, China,

and Japan; 20 missions in all, 21 central stations, 400 out stations, and 54,735 communicants (30,782 of them in Europe); income (1873-'4), \$261,000; expenditures, \$289,309. The missionary society of the Methodist Episcopal church was organized in 1819, and has missions in Germany, Denmark, Norway, Sweden, Italy, European Turkey, Africa, India, China, Japan, the West Indies, Mexico, and South America, with 200 missionaries, 435 assistants, 317 teachers, 14,683 communicants, 5,335 probationers, 21,242 pupils, and an income of \$337,190. The Protestant Episcopal church organized a board of missions in 1820. It has missions in Greece, west Africa, China, Japan, the West Indies, and among the American Indians, with 3 missionary bishops, 17 missionaries, 23 native clergy, 22 churches, 400 communicants, 50 schools, 1,700 scholars, and an income (1873) of \$114,110.—The board of foreign missions of the Presbyterian church was formed in 1837, sustained by the "Old School," while the other branch still cooperated till 1870, as before mentioned, with the American board. It was preceded by a number of smaller societies, which confined their labors mainly to the Indians. Presbyterian missions were begun in Africa in 1832, in India in 1833, in China in 1838, and among the Chinese in California in 1852; and more recently the board has sent missionaries to South America, Mexico, Siam, and Japan, besides reinforcing and enlarging the missions in Syria, Persia, and Africa, which were received from the American board. It has 134 missionaries, 116 native pastors and preachers, 440 other native laborers, 6,272 communicants, 12,533 scholars, and an income (1873) of \$623,000, \$128,000 having been raised by special effort to pay a debt. The Presbyterian church, South, organized a separate board in 1861, and now has 21 missionaries and 38 assistants, laboring among our own Indians, in Mexico, South America, Italy, Greece, and China. The society reports an income (1873) of \$42,431. The United Presbyterian missionary society, organized in 1859, has missions in Syria, Egypt, India, and China, 23 stations, 13 missionaries, 83 native ministers and teachers, 21 churches, 655 members, 22 schools, 2,358 scholars, and an income of \$65,653. The Evangelical Lutheran church has sustained a mission in India since 1841, which now has 5 ordained missionaries and 40 native assistants; it has also a station in Liberia, with 3 missionaries. Its receipts in 1873 were \$28,000. The Seventh Day Baptists commenced missionary operations in 1842, and have small missions in west Africa and China. The Baptist church, South, constituted a society in 1845, and has missionaries in China (4), Africa (10), Italy (6), and among the American Indians (56 native preachers and 2,800 members), with an income of \$52,000. The Methodist Episcopal church, South, has 2 missionaries in China, with 3 or 4 native laborers, and 12 white preachers and 16 native ministers

among the American Indians. The Freewill Baptists and the Unitarians have done something in India.—Some of the friends of missions separated from the older organizations on the ground of their complicity with slavery, and thus the "Free Baptist Missionary Society" was organized in 1843, with a mission in Hayti; and the "American Missionary Association" was formed in 1846. In the latter three smaller organizations, the "Union Missionary Society," the "Committee for the West Indian Mission," and the "Western Evangelical Missionary Association," were soon merged, and gave it missions in the West Indies, among the North American Indians, and in western Africa. It has also had a small mission in Siam, and another in the Hawaiian islands. Since the civil war, however, its energies have been devoted to the freedmen of the south, establishing schools and colleges, furnishing teachers and professors, and aiding in forming churches. It has three missionaries in the West Indies, two in west Africa, one in Siam, and one in the Hawaiian islands. It has recently announced its purpose of relinquishing all its foreign work, except the Mendi mission in west Africa, and concentrating its efforts upon the colored people of the south, where it already has 47 churches, 2,898 members, 65 schools, 7 colleges, 323 ministers, missionaries, and teachers, and 14,048 scholars. The society has also a mission among the Chinese in California. Its income in 1873 was \$345,277. The "American and Foreign Christian Union," supported by several denominations, was established in 1849 by the union of three smaller societies, and its labors have been devoted chiefly to the Roman Catholics of America and Europe, with missions in Mexico, South America, France, and Italy. But of late years the various denominations have undertaken the same work by their separate societies, and as the society was thus losing a large part of its constituency and resources, in 1872 it transferred its foreign work to other societies, and now confines its efforts to the Roman Catholics of the United States. Its receipts in 1873 were \$28,571.—Recently a number of ladies' missionary societies have come into existence. The first was the "Woman's Union Missionary Society," established in New York in 1861, with special reference to work among the zenanas of India, sustained by different denominations; it has 350 auxiliaries, with female laborers in India, China, and Japan, and an income (1873) of \$46,000. The "Woman's Board of Missions," sustained chiefly by the Congregationalists and auxiliary to the American Board, was organized in 1868; it has 500 auxiliaries, and an income of \$77,000. Similar societies have been organized in connection with the Methodist church (1869), with 1,500 auxiliaries and an income of \$64,309; in the Presbyterian church (1871), with 376 auxiliaries and receipts of \$87,316; and in the Baptist church (1871), with 600 auxilia-

ries, and receipts of \$33,378.—3. *Continental Europe.* The continent of Europe has remained, in zeal for the missionary cause, far behind England and America. The first country which, at the close of the 18th century, followed the example of the English, was Holland, which formed in 1797, mainly through the influence of Dr. Vanderkemp, a Dutch missionary employed by the London missionary society, the "Netherlands Missionary Society," at Rotterdam. The political events, in consequence of which Holland lost her colonies, caused a postponement of independent operations till 1819, when they commenced in the Indian archipelago, which is still their chief seat. The missions in India proper, when Holland exchanged with Britain these settlements, were transferred to English societies, but other missions were founded at Surinam, Guiana, and in Curaçoa in the West Indies. The society sustains a seminary at Rotterdam, and counted among its missionaries the celebrated Dr. Gützlaff.—The most extensive of the missionary societies of continental Europe is that of Basel. Unlike the others, it was preceded by the establishment of a missionary seminary in 1815, which has furnished a number of devoted missionaries to other societies, especially English. An independent society, the "Evangelical Missionary Society of Basel," was formed in 1821, which now sustains missionaries in west Africa, India, and China. The income in 1872 was 864,167 francs. The society employs 98 European missionaries, 59 European ladies, and 210 native laborers, and has 3,718 communicants. The Basel society has received from its foundation the missionary contributions from a number of the German churches. Afterward several other societies sprang up, whose operations, however, have been thus far inferior to those of the English and American societies. Those exclusively or mainly Lutheran are the Evangelical Lutheran missionary association of Leipzig, founded in 1836, and occupying in southern India the former missionary field of the Danes, with 17 European missionaries, 16 stations, embracing 397 villages, and numerous native agents; the Berlin missionary society, instituted in 1824, and supporting a mission in southern Africa with 31 stations and 48 laborers; and the Hermannsburg society, founded in 1854, which has adopted the plan of sending out entire missionary colonies. Those whose sympathies are with the evangelical party are the Rhenish missionary society, founded in 1828, Gossner's missionary union, in 1836, and the North German missionary society, in 1836, which have missions in Africa, India, China, the Indian archipelago, and the islands of the Pacific. The Rhenish society has 11 missionaries, 13 native helpers, 9 stations, and more than 1,400 adherents, among the Batta people of Sumatra. Special associations for China have been formed in Cassel, Berlin, and Pomerania, mostly occasioned by the reports of Dr. Gützlaff; and it was intended to unite them all into a central Chinese missionary association, but this proved unsuccessful. Of late years, the aggregate receipts of the German missionary associations have rapidly risen, as the supreme authorities of nearly all the state churches have strongly recommended them and prescribed the taking up of an annual collection in every church.—France has had a missionary society since 1822, which sustains a flourishing mission among the Bassutos of southern Africa, where it now has 17 stations, 69 native helpers, and 2,229 communicants. Its income is 13,784 francs.—The Scandinavians have been as yet hardly represented in the foreign missionary field. The Swedes have almost restricted themselves to sending preachers to the Laplanders, and only China has received a few missionaries from a society in Lund. The Norwegian missionary society, established in 1842, has some agents among the Zooloos in southern Africa. But in Scandinavia also the activity of the missionary societies is increasing. Norway founded a foreign missionary seminary at Bergen in 1859; the second Scandinavian church diet recommended the formation of one great Scandinavian missionary society; and in Denmark, the union of all the local societies into a Danish missionary society was effected in June, 1860.—There are now 52 Protestant evangelical missionary societies engaged in giving the gospel to the unevangelized nations, with an aggregate yearly expenditure of over \$5,500,000. Our own country has 574 Protestant missionaries in various fields, supported in their work at an expense of \$1,704,000.—*The Missionary Field.* Having thus considered the different missionary organizations of the Protestant world, it remains to glance at the various mission fields and see what has been accomplished. We begin with Japan, with its 33,000,000 people, one of the fields most recently opened to Protestant missionary efforts. But little direct missionary labor has yet been accomplished there, and the government has not yet granted entire freedom for the proclamation of the gospel. Still, 30 Protestant missionaries, of 11 different societies, are at work, in a limited way, in a few of the coast cities. They have done something in education, and have gathered a few converts into four churches already formed, one at Kobe, one at Ozaka, one at Yokohama, and one at Tokio, the capital. It is confidently anticipated that the government will soon remove all restrictions against the preaching of the gospel. Meantime, the readiness of the government and people to adopt the western civilization is one of the wonders of the age. Robert Morrison may be regarded as the founder of Protestant missions in China. He began his labors at Canton in 1807, and in seven years gave to the Chinese a translation of the New Testament, together with a dictionary and grammar of their own language; and in eleven years he had published the entire Bible

in their own tongue, having meantime been joined in his labors by Mr. Milne, another English missionary. But the operations of Protestant missionaries were greatly circumscribed for many years by the exclusiveness of the Chinese. It was not till 1861 that the empire was really open to their labors. From 1842 to that time the residence of foreigners, for trade or other purposes, was restricted to five cities upon the coast; but now missionaries of 22 different societies, about 150 in all, are residing in various parts of the empire, with missions virtually established in 40 walled cities and 360 villages, with 100,000 adherents and 10,000 church members. A remarkable religious movement has been developed in Chimi, a district of northern China. Thousands of people were found there called the "nameless sect," repudiating idolatry, recognizing the existence of a Supreme Being, believing in a final judgment, and looking for a "deliverer." Missionaries have visited them and given them more perfect instruction, baptized many, and organized a church among them, and many of them now recognize Jesus Christ as the "deliverer" for whom they were looking. In the province of Chikiang are 1,500 native Christians, with at least 100 native ministers, catechists, and teachers. There are 12 Protestant chapels and 20 missionaries in Peking. The Bible and other religious books have been given to the Chinese in several of the different dialects of their language, together with a dictionary of the Canton dialect by Dr. Morrison, as already mentioned, of the Fokien dialect by Dr. Medhurst, and of the Mandarin by S. Wells Williams. Eight presses are in constant operation at Shanghai alone, where 18,000,000 pages a year are printed. As many as 150 works on science, medicine, history, geography, law, and miscellaneous subjects, have been published in China by Protestant missionaries. These works are in a style acceptable to the learned classes, and many of them have been reprinted by the Chinese themselves, and thus added to the permanent literature of the country. Conspicuous among such works is Wheaton's "International Law," translated by an American missionary and published at the expense of the government. A healthful influence has thus been exerted upon the educational interests of the country, and a demand for the western sciences has been created. An American missionary is president of the imperial university of Peking, and Chinese youth are being sent in considerable numbers to America and Europe for education. Another striking illustration of the influence of missions in China is the fact that the Chinese in some places are resorting to preaching to meet and oppose the progress of Christian truth, defending idolatry by public sermons in halls and temples. Men are selected for this service by competitive examination. The people are also resorting to works of benevolence, founding hospitals and

dispensaries, distributing medicines and coffins gratuitously to the poor, and establishing free schools and lyceums. Coming westward, we find Moravian missionaries laboring on the borders of Thibet. American Presbyterians have 3 churches and 60 members in Siam. American Baptists are at work successfully in Assam, especially among the Garrows, a hill tribe, where many are accepting Christianity. European missionaries are in the islands of Sumatra, Borneo, Celebes, and the Moluccas, with encouraging prospects, but no great results yet reached.—Work was begun in Burmah by the Baptists of America in 1813, under the lead of the celebrated Adoniram Judson. Their greatest success has been among the Karens, a native tribe more accessible than the ruling classes. There are 75 Protestant missionaries laboring in that land, with 421 native preachers, 372 churches, 20,000 members, more than 60,000 adherents, and 6,000 children in schools. The king is friendly to the missionaries, and disposed to encourage his people to receive at least the western civilization. He has ordered the translation of an English cyclopædia into the Burmese tongue, that his people may have access to the treasures of knowledge, and has built a school house for 1,000 scholars, to educate the best of the young men for teachers of the people.—India is as large as all the United States of America east of the Mississippi, and inhabited by nearly 240,000,000 people, speaking a large number of languages and dialects. The first Protestant missionaries to India were from Denmark, sent to Tranquebar by the king in 1706. They were few, however, and accomplished but little. The real work for that land was begun by Carey in 1793. Since that time 33 societies have established missions in India. The American board has labored among the Mahrattas in Bombay, Ahmednuggur, Seroor, Sattara, and that region, and among the Tamil people of the Madras and Madura districts and Ceylon. The church missionary and London societies have labored with great success among the Shanars, or devil worshippers, and other tribes in southern India, where they now number among the Shanars alone 90,000 adherents and 12,000 communicants. Of this region the official "Blue Book" says: "The districts are dotted over with flourishing villages and Christian churches. There are hundreds of native teachers employed among them, of whom 56 are ordained and supported to a great extent by their congregations. Order and peace rule these simple communities, which give the government little trouble; while large tracts of country have been brought under cultivation, and the peasantry enjoy a larger share of material comfort than in days gone by." A great revival has recently occurred among the Syrian Christians of Malabar and Travancore, an ancient Christian sect which had lost almost all of Christianity except the name. The church missionary and London societies have long been laboring

among them, but this revival has been promoted mainly by the preaching of native evangelists, and, though marked with some extravagances, thousands are thought to be truly converted. American Baptist missionaries are meeting with like encouragement among the Telugus in the east. In 10 years the converts have increased from 23 to 6,418. The church at Ongole had two members in 1866, and 2,357 in 1873. Like success has been realized by European missionaries among the Kols and Santals, aboriginal tribes W. and N. W. of Calcutta, 10,000 adherents having been gained among the former since 1845, and 220 added to the churches among the latter in 1872. American Presbyterians are occupying Mynpooree, Futtehgur, Saharunpoor, and Allahabad, principal cities to the northwest, along the valley of the Ganges. American Methodists are in Bareilly, Lucknow, and Moradabad, of the same region; and European missionaries are in almost every part of the land. Naryan Sheshadri, the Brahman whose visit to England and America excited great interest in 1873, is establishing and superintending a chain of missionary operations through several cities and villages 300 miles N. E. of Bombay. Other Brahmans are preaching the gospel, and learned pundits are attacking the popular idolatry. Nearly 500 Protestant missionaries are now laboring in India (Ceylon included), with 400 principal stations and 2,000 out stations, aided by 240 native preachers, with 60,000 members of Christian churches, and 140,000 pupils in Christian schools. The whole Bible, or parts of it, and other books have been translated into 30 of the different languages of the country. And the above numbers by no means represent the entire change wrought there by missions. The increase in conversions in the last ten years is 50 per cent. greater than it was in the previous ten, and many of the churches are self-supporting, the native converts paying already \$100,000 a year for the maintenance of their own Christian institutions, while other thousands have renounced idolatry and caste, who have not yet accepted Christianity. One marked indication of this is in the rise of the society called the Brahmo Somaj, of which Chunder Sen, an educated Hindoo, is the acknowledged leader. Its members discard the entire Hindoo mythology, believe in one God, Creator of heaven and earth, and accept the morality of the Bible, but not the doctrines of the Trinity, atonement, &c. They are regarded as deists; and yet Chunder Sen is reported as saying: "The spirit of Christianity has pervaded the whole of Indian society, and we breathe, think, feel, and move in a Christian atmosphere. Native society is being roused, enlightened, and reformed under the influence of Christian education."—English missionaries are at work among the aborigines of Australia and in the island of Mauritius. In the latter the church missionary society has 1,118 communicants, and the society for

the propagation of the gospel 594. Little or nothing has been attempted by Protestant missionaries among the people of Afghanistan, Beloochistan, or Arabia. Protestant missionaries from America entered Persia in 1834. Their work has been confined almost exclusively to the Nestorians, an ancient Christian sect, chiefly in the N. W. part of the empire; the city of Oroomiah, with its 25,000 inhabitants, being the chief seat of their operations. Among the Nestorians of Persia, who number about 150,000, 7 missionaries of the American Presbyterian church are laboring, with 54 native pastors and preachers, 17 churches, 767 communicants, 70 schools, and 1,124 scholars. The cities of Tabriz and Teheran have more recently been occupied, and more direct efforts are to be made to reach the Mohammedans, some of whom have already embraced the Christian faith. The Nestorians had the Scriptures, but in an unknown tongue. The missionaries have translated the Bible into the modern Syriac, the language of the people. Constantinople has been the principal centre of operations for the 40,000,000 of the Turkish empire, especially for the work of the press. Able men have devoted much time to the translation of the Scriptures and other books into the languages of the empire. Religious papers are also published in that city and widely scattered through the empire. Nothing could be done at first among the Mohammedans, it being death to any Mussulman to change his religion; but that law has been abrogated, and religious liberty secured to all classes, by imperial firman, although persecution has not altogether ceased. But the labors of the missionaries have been devoted chiefly to the Armenians, Greeks, and other Christian sects, with a view to reaching the Mohammedans in the end. For this purpose 50 missionaries of the American board are now occupying most of the principal cities of the empire, not only preaching the gospel, but establishing schools, training up teachers and preachers, translating and printing books for schools and for general reading, gathering converts into native churches, and ordaining native pastors over them. The Protestant churches now number over 4,000 members, and the Protestant adherents over 23,000, making one of the recognized sects or communities of the empire, with its civil head residing at the capital and guarding its interests. A great demand for education has been created by these missionary operations. Previously female education was a thing almost entirely unknown; now female seminaries and primary schools for girls are found in many parts of the empire, and thousands of women can read and are teaching others. Schools and academies for boys are multiplied, and colleges have become a necessity. One has been for years in successful operation at Constantinople, endowed chiefly by the liberality of Christopher R. Robert, a merchant of New York, whose name it bears. It has 250 students of 13 different nationalities. Another is just

starting at Aintab, a city of about 35,000 inhabitants, in northern Syria. The native converts themselves have asked for it, and have contributed liberally toward founding it. The native Turkish schools have felt the impulse of improvement, and are far better than they were before mission schools were established among them. Training schools or theological seminaries are also in operation at four of the principal cities of the interior (Marsivan, Kharput, Marash, and Mardin), to educate native ministers. A similar work has been done mainly by American missionaries in Syria, the Bible having been translated into pure Arabic, and 60 Protestant schools established with 3,000 scholars, besides a college proper, a medical college, and a theological seminary. In self-defence the Greeks, Roman Catholics, and Armenians of the land have started as many more schools, to keep their children from Protestant influences. There are about 20 missionaries in Syria, 500 church members, and printing presses issuing 11,000,000 pages of religious books yearly.—In 1830 the American board and American Episcopalians entered Greece, and American Baptists followed in 1836. The Episcopalians have done little besides maintaining a school at Athens. Dr. King of the American board contended earnestly for liberty to preach the gospel and make converts. Although as strongly opposed by the leading powers in church and state, he finally succeeded; religious liberty has been secured, a few churches have been formed, and some native Greeks are preaching the Protestant faith.—In Africa, with its 200,000,000 people, we find 10 missionaries of the United Presbyterian church of America, male and female, laboring in Egypt, chiefly among the 150,000 Copts, an ancient Christian sect, who have been sunk for ages in a darkness and superstition equal almost to any heathenism. Their most prosperous station is at Siout. They have 9 stations in all, 508 church members, 14 schools, 600 scholars, and 22 theological students. Miss Whately, an English lady, has also a large school in Cairo, and the Kaiserswerth deaconesses are laboring in Alexandria. English missionaries labored in Abyssinia from 1829 to 1838, but were then expelled by the king at the instance of the Jesuits. Another mission was started in 1854, but was soon crushed out by similar influences. The "Pilgrim Society of St. Krishana" now has one missionary at Adowa, capital of Tigré, and another at Ankobar, in the kingdom of Shoa; and eight African youths, educated at St. Krishana, have returned under the guidance of a missionary of the London Jewish society to labor among the Jews. Swedish missionaries are laboring at Massowah and Ailat, on the borders, where they have met with some success in their schools. A beginning has been made by English missionaries at Zanzibar, east Africa, in two small stations, but as yet with insignificant results.

The west coast presents a different aspect. Between Sierra Leone and the Gaboon, a distance of nearly 2,000 miles, 12 or more Protestant societies have missions, with about 20,000 children in Christian schools and as many members gathered into Christian churches. The slave trade has disappeared from this region, where it formerly had 20,000 victims a year. Mohammedanism is said to be making some advances in the interior of Africa, while Protestant Christianity is disputing its sway upon the coast. About 20 societies are operating in southern Africa, among the Bushmen, the Hottentots, the Bechuanas, the Zooloo Caffres, and other tribes. Large colonies of European settlers have occupied portions of the country, so that the whole territory, for 1,000 miles north of the Cape of Good Hope, is possessed by these colonists, or dotted over with mission stations among the native tribes. Here also, as in west Africa, the people were without written languages, or schools, or books of any sort. The languages have been reduced to writing, books prepared, schools established, and churches organized, whose members are now reckoned at 30,000, some with native pastors over them. About 100,000 people in southern Africa are thus recovered from heathenism, and have settled down to habits of civilized life. The Lovedale educational institution of the Free church of Scotland, with a school of 150 boys and 30 girls, is doing much to prepare suitable teachers for the people.—In Madagascar, inhabited by about 5,000,000 people, missionary operations were commenced in 1818, by the London missionary society, but soon suspended by the death of three out of the four who composed the first missionary party. Other missionaries landed in 1820, and met with great success in their labors for several years. The king favored their operations; the language was reduced to writing; the Scriptures and other books were translated into the native tongue; schools were established and many converts were made. But after the death of the king, in 1828, the queen, who succeeded him on the throne, began to manifest hostility to the new religion, soon became a fierce and relentless persecutor, drove the missionaries from the island, and slaughtered thousands of her best subjects, as many as 2,000 sometimes being killed in a single year. Yet secretly the truth was spreading all the time, and when at length the queen died (July 16, 1861) and her own son came to the throne, he at once proclaimed entire freedom in religious matters, and the missionaries were invited to return and resume their labors. Not long after, however, the king proved treacherous and was put to death by his own nobles, and his widow was crowned queen under a written constitution, guaranteeing the fullest religious liberty. Although she was herself an idolater to the last, she was true to her coronation oath. She died April 1, 1868, and her sister, who succeeded to the throne, has

been friendly to the new religion from the first, and is a member of one of the native churches. Ever since the death of the first queen, the missionaries have enjoyed the largest liberty in the prosecution of their work. Nearly half a million of people have already renounced their idolatry; the state idols have been burned; large congregations are gathered every Sunday for Christian worship; thousands have learned to read, and 60,000 are numbered as communicants in the churches; a change more rapid and remarkable than in any other mission field.—Turning westward again, it is something noticeable that Protestant missionaries are now laboring in Italy, Spain, and Austria; countries from which until quite recently they were excluded. The Protestant church members in Italy are now 4,000. Such are some of the changes in the old world.—In America, the labors of the missionaries among the Indians have not been altogether in vain. The Creeks, Cherokees, and Choctaws had virtually received the Christian religion 20 years ago, but the civil war deprived them for a time of their religious teachers and retarded their progress. They, however, have schools, churches, and native pastors, supported by themselves. Missionaries are also at work among the Chippewas, the Sioux, the Pawnees, the Delawares, the Oneidas, the Nez Percés, and other tribes within the territory of the United States. English missionaries are in like service in Manitoba, around Hudson bay, in British Columbia, and on Mackenzie river. Sixteen different societies have missions among the Indians of North America; and it is estimated that 10,000 of them are now members of Christian churches, and 75,000 including women and children, have settled down to habits of civilized life. The present attitude of the government is regarded as highly favorable to greater success in Christianizing the Indians. The Moravians have 24 missionary agents, 45 native assistants, and 948 communicants among the Greenlanders; and 45 missionary agents, 36 native assistants, and 434 communicants in Labrador.—Through all this modern missionary era many of the blacks of the West India islands have been regarded as but little better than pagans, and English and American missionaries have labored among them with great self-denial. It is estimated that 80,000 are now members of Protestant churches. Protestant missionaries, 12 in number, are laboring in Mexico, occupying six of its principal cities, with 12 congregations in and around the capital. Great numbers of Bibles are sold; the people are asking for schools and learning to read, a new thing with them. A like work has been begun in Colombia, Chili, and Brazil, from which countries Protestant missionaries were excluded until within a few years. The Moravians have long had a prosperous mission in Surinam, and now have 13 stations, 65 missionary agents, 406 native assistants, and 5,507 communicants.

—In the islands of the Pacific all was pagan, and a large part cannibal, 60 years ago. The people were without written languages, without books, without schools, and sunk in the lowest degradation. English and American missionaries have vied with each other in the work of elevating them. Twenty languages have been reduced to writing. Elementary books and translations of the Scriptures have been prepared in them, schools opened, teachers trained for them, and hundreds of thousands of the people have been taught to read. Churches have been organized and native pastors placed over them. Men are now preaching the gospel on these islands who had participated in a hundred cannibal feasts. The first missionaries to the Hawaiian islands landed there in 1820, and since that time the number of converts received into their churches is about 70,000; the present number is 12,360, gathered in 57 churches, most of them having native pastors. These churches, with some aid in men and means from the American board, themselves now sustain a foreign mission in the Micronesian islands, 3,000 miles S. W. of their own country, and another on the Marquesas islands, nearly as far S. The Hawaiian islands have been for some years regarded as Christianized, and no longer missionary ground. Like changes have occurred further south, under the labors of English missionaries, of the London, Wesleyan, and Church missionary societies. They have labored in New Zealand, and in the Society, Friendly, Feejee, and other islands, with such success that idolatry and cannibalism have disappeared from almost the whole of eastern Polynesia. More than 300 islands have almost entirely relinquished their heathenism, and more than 400,000 of these recent savages are virtually Christianized. The number of communicants gathered into their churches was long since reckoned at 50,000, and now can hardly be less than 60,000.—According to the estimates given, the number of converts now living and gathered into Christian churches by the labors of Protestant missionaries throughout the world is as follows: in China, 10,000; Burmah, 20,000; India, 60,000; Turkey, 4,000; west Africa, 20,000; south Africa, 30,000; Madagascar, 60,000; the Indians of North America, 10,000; the blacks of the West Indies and Guiana, 80,000; and the Pacific islanders, 60,000; making a total of 354,000 communicants, representing communities of nominal Christians to the number of nearly 2,000,000, without including the scattered few in Japan, Siam, Persia, Syria, Egypt, Greenland, Mexico, Peru, and Brazil. There are now about 2,000 Protestant missionaries engaged in the work, aided by 10,000 native pastors and preachers whom they have trained; and missionaries have translated the Bible and many other books into nearly 200 languages and dialects. Probably 100 of the missionaries are medical men, who combine the healing art with their reli-

gious instruction, and thus get access to thousands who could not otherwise be reached. From 12 to 20 medical dispensaries are in operation in India alone for the gratuitous treatment of diseases, in which generally religious services are also held. Dr. Parker treated 55,000 Chinese during his residence in Canton, relieving all sorts of maladies, exciting the liveliest gratitude in the minds of most of his patients, and preparing the way for Christian instruction. More recently female physicians have been sent to some mission fields, with special reference to reaching the women in the seclusion of their homes. In Japan Dr. Berry of the American board has induced the people to establish seven hospitals, of which he is to have the oversight.—The literature of Protestant missions is very copious. Almost every missionary society publishes a periodical, which, together with the annual reports of the societies, is the most trustworthy source of information for the missionary history of a particular denomination. The number of works published by missionaries on special countries is likewise very large. Among the works extending over the whole ground are: W. Brown, "History of the Propagation of Christianity among the Heathen since the Reformation" (2 vols., London, 1814); Huie, "History of Christian Missions from the Reformation to the Present Time" (Edinburgh, 1849); Wiggers, *Geschichte der evangelischen Missionen* (2 vols., 1845-'6); *Handbüchlein der Missionsgeschichte und Missionsgeographie* (Calw, 1844); Newcomb, "Cyclopædia of Missions" (New York, 1860); Aikman, "Cyclopædia of Christian Missions" (London, 1860); Anderson, "Foreign Missions, their Relations and Claims" (New York, 1869; Boston, 1870); Grundemann, *Missions-Atlas* (Gotha, 1867-'71); and "Missionary World" (London, 1873).

MISSISQUOI, a S. W. county of Quebec, Canada, bordering on Vermont, and bounded S. W. by the Richelieu river; area, 358 sq. m.; pop. in 1871, 16,922, of whom 7,114 were of French, 4,513 of English, 2,138 of Irish, 1,950 of German, and 979 of Scotch origin or descent. It is indented by Missisquoi bay, an inlet of Lake Champlain, and is traversed by the N. division of the Vermont Central railroad. Capital, Frelighsburg.

MISSISSIPPI, one of the S. W. states of the American Union, and the seventh admitted under the federal constitution, situated between lat. 30° 13' and 35° N., and lon. 88° 7' and 91° 41' W.; extreme length N. and S., 332 m.; average breadth 142 m., varying from 78 m. below lat. 31° N. to 189 m. on that parallel, and 118 m. on the N. line; area, 47,156 sq. m. It is bounded N. by Tennessee; E. by Alabama; S. between the Alabama line and Pearl river by the gulf of Mexico, and from the Pearl to the Mississippi on the parallel of 31° by Louisiana; and W. by Louisiana and Arkansas, having below lat. 31° the Pearl river, and above that parallel the Mississippi, as the dividing

lines. The state is divided into 78 counties, viz.: Adams, Alcorn, Amite, Attala, Benton, Bolivar, Calhoun, Carroll, Chickasaw, Choctaw, Claiborne, Clark, Coahoma, Colfax, Copiah, Covington, De Soto, Franklin, Greene, Grenada, Hancock, Harrison, Hinds, Holmes, Issaquena, Itawamba, Jackson, Jasper, Jefferson, Jones, Kemper, Lafayette, Lauderdale, Lawrence, Leake, Lee, Leflore, Lincoln, Lowndes, Madison, Marion, Marshall, Monroe, Montgomery, Neshoba, Newton, Noxubee, Oktibbeha, Panola, Pearl, Perry, Pike, Pontotoc, Prentiss, Rankin, Scott, Simpson, Smith, Sumner, Sunflower, Talahatchie, Tate, Tippah, Tishomingo, Tunica, Union, Warren, Washington, Wayne, Wilkinson, Winston, Yalobusha, and Yazoo. There are eight cities, viz.: Vicksburg, pop. in 1870, 12,443; Natchez, 9,057; Columbus, 4,812; Jackson, the capital, 4,234; Meridian, 2,709; Holly Springs, 2,406; Canton, 1,963; and Grenada, 1,887. The chief towns are Aberdeen, Brookhaven, Corinth, Okolona, Oxford, Pass Christian, Water Valley, and West Point, each having more than 1,000 inhabitants; and Biloxi, Brandon, Crystal Springs, Greenville, Hazlehurst, Hernando, Kosciusko, Leaf River, Lexington, Liberty, Macon, Ocean Springs, Rodney, and Tupelo, with more than 500 inhabitants each.—The population of Mississippi, according to the United States census, has been as follows:

YEARS.	White persons.	Colored persons.		Total population.	Increase per cent.
		Free.	Slave.		
1800.....	5,179	182	3,489	8,560	.....
1810.....	23,024	240	17,088	40,352	355.95
1820.....	42,176	458	32,814	75,443	86.97
1830.....	70,443	519	65,659	136,621	81.05
1840.....	179,074	1,366	195,211	375,651	174.96
1850.....	295,718	980	309,875	606,526	61.46
1860.....	358,599	773	426,681	791,805	30.46
1870.....	362,596	444,201	.....	827,922	4.58

Included in the last total are 16 Chinese and 809 Indians. Mississippi ranked 18th among



State Seal of Mississippi.

the states in total population in 1870; 25th in white population, a gain since 1860 of 8.19 per

cent.; and 4th in colored population, a gain of 1.55 per cent. Of the total population at the last census, 816,731 were native and 11,191 foreign born; 413,421 males and 414,501 females. Of the colored, 398,798 were blacks and 45,403 mulattoes. Of the natives, 564,142 were born in the state, 59,520 in Alabama, 35,956 in South Carolina, 33,551 in Virginia and West Virginia, 31,804 in Tennessee, 28,260 in Georgia, 27,941 in North Carolina, 9,417 in Louisiana, 8,927 in Kentucky, 3,250 in Maryland, 2,410 in Missouri, 2,176 in Arkansas, 1,458 in New York, 1,171 in Ohio, and 1,145 in Texas. Of the foreigners, 3,359 were natives of Ireland, 2,960 of Germany, 1,088 of England, 970 of Sweden, and 630 of France. There were 138,542 persons born in the state living in other states and territories. The number of male citizens of the United States 21 years old and upward in the state was 169,737. There were 166,828 families, with an average of 4.96 persons to each, and 164,150 dwellings, with an average of 5.04 persons to each. There were 291,718 persons 10 years old and over who could not read, and 313,310 who could not write, of whom 151,265 were males and 162,045 females, 48,028 whites, 264,902 colored, and 380 Indians and Chinese; 61,470 were between 10 and 15 years of age, 60,359 between 15 and 21, and 191,481 21 years old and upward (9,357 white males and 80,810 colored males). The number of blind persons in the state was 474; deaf and dumb, 245; insane, 245; idiotic, 485. The number of paupers supported during the year ending June 1, 1870, was 921, at a cost of \$96,707; receiving support at that date, 809; number of persons convicted of crimes during the year, 471; in prison at the close, 449. Of the whole number of persons 10 years old and over returned as engaged in occupations (318,850), 259,199 were employed in agriculture, 40,522 in professional and personal services, 9,148 in trade and transportation, and 9,981 in manufactures and mining. Among special occupations represented there were 181,523 agricultural laborers, 77,102 farmers and planters, 749 clergymen, 15,836 domestic servants, 15,969 laborers, 1,969 launderers and laundresses, 682 lawyers, 743 government officials and employees, 1,511 physicians and surgeons, 1,524 teachers, 3,834 traders and dealers, 2,429 clerks, salesmen, and accountants, 1,415 officials and employees of railroad companies, 500 draymen, teamsters, &c., 1,233 blacksmiths, 2,072 carpenters and joiners, 561 cotton and woollen mill operatives, and 573 milliners and dressmakers.—Except in the Mississippi bottom, the surface of the state is generally hilly or undulating, with a slope S. W. and S. Few of the ridges rise as high as 400 ft. above the drainage of the surrounding country, the usual elevation being from 30 to 120 ft. above the minor watercourses, and probably none is 800 ft. above the sea. The Mississippi bottom comprises an elliptical area, extending from Vicksburg N. to the Tennessee line, and em-

bracing on the east the valley of the Yazoo and Tallahatchie rivers. It is upward of 50 m. wide in the central portion, and is swampy and liable to inundation. East of this the country is generally hilly, with tracts of prairie in the E. portion, and a narrow belt, level but wooded, called the "flat woods," extending from Tappah creek in Tippah co. to De Kalb in Kemper co. The central portion of the state E. of Vicksburg is hilly or undulating, interspersed with prairies. South of this is an undulating and sometimes hilly region, extending to the coast. The country along the Mississippi below Vicksburg for 10 or 15 m. inland is hilly, elevated from 50 to 150 ft. above the river; it is called the "cane hills" or "bluffs." At the mouths of the streams along the gulf are extensive marshes.—Mississippi has a coast on the gulf of Mexico of 88 m., or including irregularities and islands of 287 m. The principal harbors are those of Pascagoula, Biloxi, Mississippi City, and Shieldsborough (on bay St. Louis), but they do not admit large vessels. About 10 m. from the shore is a chain of low sandy islands, the chief of which are Petit Bois, Horn, Ship, and Cat islands, separated from the mainland by Mississippi sound. The state, with the exception of the N. E. corner, which is separated from Alabama by the Tennessee river, is drained either directly or through the Mississippi river into the gulf of Mexico. The Mississippi forms its W. boundary for more than 500 m. by its windings; but for more than three fourths of this distance, from the N. limit of the state to Vicksburg, the configuration of its banks admits of no port, and below that city the only one of much importance is Natchez. The principal affluents of the Mississippi from this state, commencing at the south, are the Homochitto, Bayou Pierre, the Big Black, and the Yazoo rivers. North of the Yazoo the great swamp is traversed by numerous streams, often interlocking, among which may be mentioned the Sunflower, which leaves the Mississippi in the N. part of the state, and traversing the swamp joins the Yazoo about 35 m. above its mouth, and the Cold Water, an affluent of the Tallahatchie, which is connected by an arm with the Mississippi just above the Sunflower. The Yazoo, which by its affluents drains the N. W. part of the state, is formed by the junction of the Tallahatchie and Yalobusha rivers, and joins the Mississippi a short distance above Vicksburg. The main stream is navigable throughout, and its constituents for considerable distances. The Big Black rises in the N. central portion of the state, and is navigable by steamers for 50 m. above its mouth. The principal rivers that enter the gulf from this state are the Pearl and Pascagoula. The former rises in the central region and flows past Jackson; the latter with its constituents, the Leaf and Chickasahay, drains the S. E. portion of the state, and just before entering the gulf receives the Escatawpa from Alabama; small boats can ascend for more than 100 m. from

its mouth. The Tombigbee river rises in the N. E. part of Mississippi, and flows into Alabama; it is navigable to Cottonginport, 10 m. above Aberdeen.—Four geological periods, the carboniferous, cretaceous, tertiary, and post-tertiary, are represented. The first occurs only in the N. E. corner, and consists chiefly of limestone, chert or hornstone, and silicious sandstone. W. and S. of this is the cretaceous, occupying a triangular area, extending W. along the Tennessee line beyond the Hatchie river (about 35 m.) and S. along the Alabama border beyond Macon (about 125 m.). This formation, which contains many fossils, consists of four groups, the Eutaw, the Tombigbee sand group, the rotten limestone, and the Ripley group. The tertiary occupies the rest of the state, except the W. portion along the Mississippi river, and consists of seven groups, viz.: the northern lignitic, the silicious Claiborne, the calcareous Claiborne, the Jackson, the Vicksburg, the Grand Gulf, and the coast pliocene. The post-tertiary has four principal divisions: the orange sand, the bluff, the yellow loam, and the alluvial formations. The first consists of silicious sands, usually colored with hydrated peroxide of iron or orange-yellow ochre, and overlies the carboniferous, cretaceous, and tertiary formations, though wanting in portions of the Jackson and rotten limestone groups and in the flatwoods. It also occurs to some extent in the bluff formation, which coincides with the district already described as the cane hills, and likewise stretches in a narrow belt along the E. margin of the Mississippi bottom. Deposits of yellow, brown, or reddish loam form the actual surface of the greater portion of the state. The alluvium occupies the Mississippi bottom, and is separated from the northern lignitic by the narrow belt of the bluff formation.—Except in the Mississippi bottom, where malarial fevers frequently occur in summer, the state is generally healthy. The summers are long and hot, the winters somewhat colder than in the same latitude on the Atlantic coast. The mean temperature of the year ending Sept. 30, 1872, at Vicksburg (lat. $32^{\circ} 23'$), was 66.4° ; of the warmest month (August), 84.6° ; of the coldest month (January), 42.7° ; total annual rainfall, 57.77 inches. The mean temperature of the succeeding year at the same place was 64.67° ; warmest months (July and August), 82° ; coldest month (January), 43° ; total rainfall, 48.04 inches. The number of deaths in 1870 was 9,172, of which 2,883 were from general diseases, 1,043 from diseases of the nervous, 224 of the circulatory, 1,707 of the respiratory, and 1,274 of the digestive system. Among special diseases, measles proved fatal in 272 cases, enteric fever in 333, intermittent fever in 377, remittent fever in 256, whooping cough in 159, consumption in 695, dropsy in 192, encephalitis in 283, meningitis in 125, apoplexy in 66, convulsions in 180, croup in 281, pneumonia in 1,177, enteritis in

287, dysentery in 103, diarrhoea in 325, and cholera infantum in 143.—The soil of the Mississippi bottom is very fertile. The region E. of this, characterized by the deposits of yellow loam, is generally fertile, though in places easily exhausted. The N. E. portion, except the prairies, is less productive. The cane hills and the central belt of the state possess a generally productive soil. The S. region has a generally poor and sandy soil, particularly along the coast. The principal forest trees in the uplands of the N. portion of the state and in the bluff region are the short-leaved pine, various species of oak, the chestnut, hickory, poplar, black walnut, locust, beech, gum, holly, basswood, sassafras, elm, and magnolia. The prevalent growth of the sandy region in the south is the long-leaved pine. The islands are partially covered with sparse forests of pitch pine; this species also occurs on the mainland near the coast. In the swamps and bottoms are dense thickets of cane and cypress. The prairies where uncultivated are covered with grass during the greater part of the year, and the forests of long-leaved pine have commonly an undergrowth of long grass, which affords good pasturage. Cotton (in the production of which Mississippi surpassed all other states in 1870) and Indian corn are the staple crops. Wheat and other grains are grown in the north, and rice and the sugar cane in the south. All the fruits of temperate climates grow here in perfection; plums, peaches, and figs are abundant, and in the south the orange. The deer, cougar (commonly called panther), wolf, bear, and wild cat are still common. Alligators occur in the Mississippi as far N. as the mouth of the Arkansas, and in some of the smaller rivers; and most of the streams abound in fish. Paroquets are seen as far N. as Natchez, and wild turkeys and pigeons abound. Oysters and fish are abundant in Mississippi sound.—According to the census of 1870, the number of farms was 68,023, of which 11,003 contained less than 10 acres each, 8,981 from 10 to 20, 26,048 from 20 to 50, 11,967 from 50 to 100, 8,938 from 100 to 500, 853 from 500 to 1,000, and 233 more than 1,000 acres. There were 4,209,146 acres of improved land in farms; cash value of farms, \$81,716,576; of farming implements and machinery, \$4,456,633; wages paid during the year, including the value of board, \$10,326,794; estimated value of all farm productions, including betterments and additions to stock, \$73,137,953; value of orchard products, \$71,018; of produce of market gardens, \$61,735; of forest products, \$39,975; of home manufactures, \$505,298; of animals slaughtered or sold for slaughter, \$4,090,818; of live stock, \$29,940,238. The productions were 66,638 bushels of spring wheat, 207,841 of winter wheat, 14,852 of rye, 15,637,316 of Indian corn, 414,586 of oats, 3,973 of barley, 1,619 of buckwheat, 176,417 of peas and beans, 214,189 of Irish potatoes, 1,743,432 of sweet potatoes, 6 of

clover seed, 82 of grass seed, 2 of flax seed, 374,627 lbs. of rice, 61,012 of tobacco, 288,285 of wool, 2,613,521 of butter, 3,099 of cheese, 100 of flax, 31 of silk cocoons, 125 of maple sugar, 9,390 of wax, 199,581 of honey, 564,938 bales of cotton, 3,055 gallons of wine, 17,052 of milk sold, 152,164 of cane molasses, 67,509 of sorghum molasses, 8,324 tons of hay, 3 of hemp, and 49 hogsheads of cane sugar. The live stock consisted of 90,221 horses, 85,886 mules and asses, 173,899 milch cows, 58,146 working oxen, 269,030 other cat-

tle, 232,732 sheep, and 814,381 swine. There were also 14,379 horses and 80,172 cattle not on farms.—Manufacturing is little developed. The number of establishments in 1870 was 1,731, having 384 steam engines of 10,019 horse power, and 225 water wheels of 2,453 horse power; hands employed, 5,941, of whom 5,500 were males above 16, 191 females above 15, and 250 youth; capital invested, \$4,501,714; wages paid, \$1,547,428; value of materials used, \$4,364,206; of products, \$8,154,758. The principal industries are shown as follows:

INDUSTRIES.	No. of establishments.	Capital.	Value of products.	INDUSTRIES.	No. of establishments.	Capital.	Value of products.
Agricultural implements..	11	\$21,150	\$51,800	Leather, tanned.....	81	\$30,085	\$129,407
Blacksmithing.....	295	115,975	300,912	" curried.....	25	19,575	183,316
Boots and shoes.....	92	45,506	159,155	Lumber, planed.....	9	20,200	68,550
Carpentering and building..	195	80,958	655,085	" sawed.....	265	1,133,917	2,160,667
Carriages and wagons.....	85	188,495	268,081	Machinery.....	14	190,825	223,180
Cars, freight and passenger.....	2	122,500	143,401	Oil, cotton-seed.....	4	135,000	165,700
Clothing.....	28	18,070	61,050	Printing and publishing, newspaper.....	11	74,700	121,850
Cotton goods.....	5	751,500	234,445	Saddlery and harness.....	46	73,230	106,518
Grist mill products.....	863	636,813	2,053,567	Sash, doors, and blinds.....	5	81,700	157,050
Furniture.....	24	18,820	88,796	Tin, copper, and sheet-iron ware.....	41	91,650	189,668
Gas.....	4	109,050	55,250	Wheelwrighting.....	39	18,745	50,797
Iron, blooms and pigs.....	2	65,000	21,000	Woolen goods.....	5	191,000	122,973
" castings.....	15	112,500	126,082				

—The foreign trade of Mississippi is indirect, and almost entirely through New Orleans and Mobile. Cotton and lumber are the chief exports. The coasting and river trade is large. The coasting trade is chiefly directed to Mobile and New Orleans, while the Mississippi river trade centres in the latter, and that of the Tombigbee in Mobile. The railroads terminating at these two ports and at Memphis are also large carriers of merchandise. There are three customs districts: Natchez, Pearl River (port of entry, Shieldsborough), and Vicksburg. The direct foreign and the coasting trade are centred entirely in the district of Pearl River. The value of foreign commerce for the year

ending June 30, 1874, was \$233,406, almost entirely exports, including 13,293,000 feet of boards, 529,000 shingles, and 191,563 cubic feet of timber. The number of entrances in the foreign trade was 93, of 22,523 tons; clearances, 94, of 20,249 tons; entrances in the coastwise trade, 68, of 12,048 tons; clearances, 96, of 21,382 tons. The number of vessels belonging in the state was 117, of 6,190 tons, viz.: Natchez, 4, of 160 tons; Pearl River, 94, of 3,369 tons; Vicksburg, 19, of 2,661 tons; sailing vessels, 88, of 3,139 tons; steamers, 29, of 3,051 tons.—In 1844 there were 26 m. of railroad in the state; in 1854, 222; in 1864, 862; in 1874, 1,033½. The statistics for 1874 are as follows:

RAILROADS.	TERMINI.	Miles in operation in the state.	Distance between termini, miles.
Alabama and Chattanooga.....	Chattanooga, Tenn., to Meridian.....	18	295
Memphis and Charleston.....	Memphis, Tenn., to Stevenson, Ala.....	39	272
Mississippi and Tennessee.....	" to Grenada.....	88	100
Mississippi Central*.....	Canton to Cairo, Ill.....	183	850
Mobile and Ohio.....	Columbus, Ky., to Mobile, Ala.....	266	472
Branches.....	Muldon to Aberdeen.....	9½	9½
	Artesia to Columbus.....	14½	14½
	" to Starkville.....	11	11
New Orleans, Jackson, and Great Northern*.....	New Orleans, La., to Canton.....	118	206
Branch.....	Durant <i>via</i> Kosciusko toward Aberdeen.....	89	...
New Orleans, Mobile, and Texas.....	New Orleans, La., to Mobile, Ala.....	77	180
Ripley.....	Middleton, Tenn., on Memphis and Charleston railroad, to Ripley.....	28	26
Vicksburg and Meridian.....	Vicksburg to Meridian.....	140	140
West Feliciana.....	Woodville to Bayou Sara, La.....	7½	27

The following lines are projected or in progress: the Natchez, Jackson, and Columbus railroad, from Natchez to Columbus (180 m.); Vicksburg and Nashville, from Vicksburg to

* Consolidated as the New Orleans, St. Louis, and Chicago railroad.

Nashville, Tenn. (380 m.), with a branch from Grenada to the Mississippi river, opposite Eunice, Ark. (90 m.); Selma, Marion, and Memphis, from Selma, Ala., to Memphis, Tenn. (280 m.); Mississippi Valley and Ship Island, from Vicksburg to Mississippi City (210 m.); and Vicksburg

and Brunswick, from Eufaula, Ala., to Meridian (225 m.).—There are no national banks in Mississippi. In 1874 there were six savings banks, with an aggregate capital of about \$300,000, and five banks of deposit, incorporated under state law, with an aggregate capital of about \$550,000. One of each class also does an insurance business. At the close of 1873, 21 insurance companies of other states and countries were doing business in the state.—The government is administered under the constitution of 1869, which declares that all citizens of the United States resident in the state are citizens thereof; that no property or religious qualification for office, nor any property or educational qualification for voting, shall ever be required; that neither slavery nor involuntary servitude, except in punishment of crime, shall exist; that no law in derogation of the paramount allegiance of citizens to the United States shall be passed, and that the right of secession shall never be assumed; that no public money shall be appropriated for any charitable or other public institution making any distinction among citizens of the state; and that any person engaging in or abetting a duel shall be disfranchised and disqualified from holding office. The executive power is vested in a governor, lieutenant governor, secretary of state, treasurer, auditor, attorney general, and superintendent of public education, elected by the people for a term of four years, and a commissioner of immigration and agriculture, chosen by joint ballot of the two houses of the legislature for the same term. The governor's veto may be overcome by a two-thirds vote of both houses of the legislature. Senators are elected by senatorial districts for four years, one half retiring biennially; their number (at present 37) cannot be less than one fourth nor more than one third of that of the representatives. The representatives are elected for two years; their number cannot be less than 100 nor greater than 120 (at present 115). The judicial power is vested in a supreme court, circuit courts, chancery courts, and justices of the peace. The supreme court has appellate jurisdiction only, and consists of three judges (one from each of the three districts into which the state is divided), appointed by the governor with the consent of the senate for nine years, one retiring every three years. A session is held twice a year at the capital. There is a circuit court for each of the 15 judicial districts, presided over by a single judge appointed by the governor with the consent of the senate for six years. These courts have original jurisdiction in criminal matters and in civil cases at law when the amount in dispute exceeds \$150, and are held at least twice a year in each county. The chancery courts have jurisdiction of equity and probate matters, and are held at least four times a year in each county. A chancellor is appointed by the governor with the consent of the senate for four years for each of the 20 chan-

cery districts. Justices of the peace are elected for two years, and have jurisdiction of civil cases at law when the amount in dispute does not exceed \$150. The right of suffrage is conferred upon all male citizens of the United States (except convicts and persons of unsound mind) 21 years old and upward, who have resided in the state six months and in the county one month, and have been registered. Elections are by ballot, and occur biennially (odd years) on the Tuesday next after the first Monday in November. The political year commences on the first Monday of January, and the legislature meets annually on the following Tuesday. No one who denies the existence of a Supreme Being, or who is not a qualified elector, can hold office. The militia consists of all able-bodied male citizens between the ages of 18 and 45. It is provided that the state shall not become a stockholder in any corporation or association, nor pledge or lend its credit in aid of any person, corporation, or association; that no bank of issue shall be created or renewed, and that the legislature shall by law prohibit individuals or corporations from issuing bills as money. Amendments to the constitution must be proposed by a two-thirds vote of each house of the legislature, published for at least three months preceding the next general election, and ratified by the people. Treason, murder, and arson committed in the night upon a dwelling are punished with death. Other punishments are fines and imprisonment. The chief grounds of divorce are adultery, sentence to the penitentiary, impotence, desertion for two years, habitual drunkenness, cruel treatment, and pregnancy at the time of marriage by another unknown to the husband. A married woman may convey and devise property belonging to her at the time of marriage or afterward acquired as if single, and the same is not liable for the debts of her husband, and she may do business as a *feme sole*. The rate of interest is 6 per cent., but 10 per cent. may be stipulated for by special contract. Mississippi is entitled to two senators and six representatives in congress, and has therefore eight votes in the electoral college.—The valuation of property according to the United States censuses has been as follows:

YEARS.	ASSESSED VALUE.			True value of real and personal.
	Real estate.	Personal estate.	Total.	
1850...				\$228,951,180
1860...	\$157,586,737	\$351,636,175	\$509,472,912	607,824,911
1870...	118,278,460	69,000,430	177,278,890	209,197,845

The diminution in the value of personal property is chiefly due to the emancipation of the slaves. The total taxation not national in 1870 was \$3,736,432, of which \$1,309,655 was state, \$2,299,699 county, and \$127,078 town, city, &c.; total debt, \$2,594,415, of which \$1,796,230, including \$1,138,494 due to the educa-

tional funds, was state, \$656,585 county, and \$141,600 town, city, &c. The state held bonds and stocks to the amount of \$966,674 as security for loans to railroads, &c. According to the treasurer's report, the receipts into the treasury during the year ending Dec. 31, 1873, including \$174,670 70 on hand Jan. 1, but excluding uncurrent and worthless funds in the treasury to the amount of \$795,636 48, were \$1,332,825, of which \$366,122 74 were from state taxes, \$34,833 38 from the tax on privileges, \$116,345 86 from the penitentiary, \$240,191 05 from the school funds, and \$381,650 from the bonds (loans). The disbursements amounted to \$1,244,475 89, of which \$98,113 62 were for legislative expenses, \$247,803 70 judiciary, \$31,951 57 executive, \$157,546 71 on account of the penitentiary, \$66,561 93 public printing, \$32,350 university of Mississippi, \$88,145 lunatic asylum, \$10,316 15 executive contingent fund, \$72,849 46 interest on Chickasaw school fund, \$3,153 76 geological survey, \$6,887 50 institution for the blind, \$17,100 deaf and dumb asylum, \$38,500 Alcorn university, \$3,450 state normal schools, \$2,730 90 capitol repairs, \$19,237 97 repairs on lunatic asylum, \$89,504 79 on account of common school fund, \$100,000 in payment of state bonds, \$10,204 40 for interest on state bonds, and \$17,409 77 for interest on deposits of insurance companies; balance on hand Jan. 1, 1874, in current funds, \$88,349 11. The state debt on that date amounted to \$3,558,629 24, viz.: due school funds, \$1,157,415 69; certificates of debt, \$294,150; auditor's warrants, \$1,083,682 57; bonds, \$634,650; interest on bonds, \$73,436; interest on insurance deposits, \$15,294 98. Of the bonds \$100,000 were payable on Jan. 1, 1874, 1875, and 1876; \$150,000 on Jan. 1, 1875 and 1876; and \$34,650 on Jan. 1, 1877. This statement of the debt does not include bonds to the amount of \$7,000,000, of which the principal and interest have remained unpaid since 1842. The state institutions are the penitentiary, blind institute, institute for the deaf and dumb, and lunatic asylum, situated at Jackson. The penitentiary contains 200 cells, and is inadequate for the accommodation of the prisoners. The convicts are partly employed within the walls in manufactures, and partly leased to persons who employ them on public works in different parts of the state. The number on Nov. 30, 1872, was 212; received during the year, 227; remaining Nov. 30, 1873, 288, of whom 35 were whites and 253 colored, 280 males and 8 females; 121 were confined within the walls, 125 employed on railroads, and 42 on levees. The number of officers on July 23, 1874, was 21; of convicts, 320. In the blind institute, besides a literary training, the male pupils receive instruction in broom making, mattress making, and chair seating, and the females in domestic work. The number under instruction in 1873 was 25; remaining at the close of the year, 21; number of officers and teachers,

5. The number under instruction during the year in the institute for the deaf and dumb was 50, of whom 40 were mutes and 10 semimutes, 26 males and 24 females; average attendance, 39; remaining at its close, 36; number of officers and instructors, 5. Pupils unable to pay for tuition are educated free. The building requires enlargement. The lunatic asylum on Dec. 1, 1872, had 231 inmates; received during the ensuing 13 months, 137; remaining Dec. 31, 1873, 304, of whom 150 were males and 154 females; number of officers, 4. The number received since the opening of the asylum was 1,008 (559 males and 449 females); discharged recovered, 258; discharged improved, 66; discharged stationary, 123; eloped, 53; died, 204. The building was enlarged in 1872, but is still overcrowded.—The constitution requires the establishment of a system of free public schools for all youth between the ages of 5 and 21 years, and an act was passed in 1871 to carry this provision into effect. The schools are under the general charge of the state superintendent of public education; that officer, the secretary of state, and the attorney general form the state board of education. There is a superintendent for each county, appointed by the board of education with the consent of the senate for two years. Each county and each incorporated city of more than 3,000 inhabitants forms a school district, and has a board of six school directors, those for the cities being elected by the qualified voters, and those for the school districts outside of cities by the patrons of the schools. One or more free public schools, open to all of school age, are to be kept in each county for at least four months in each year. Teachers' institutes are to be held annually, under the general supervision of the state superintendent, for at least two weeks in each congressional district. According to the report of the state superintendent for the period from Jan. 1 to Aug. 31, 1873, returns had been received from 54 counties, reporting 252,962 youth of school age, 1,940 public schools, and 465 private schools; number of pupils enrolled in public schools, 78,066; teachers in same, 2,130; pupils enrolled in private schools (36 counties), 9,718. In 5 of the counties reporting there were private but no public schools, and in 10 public schools were in operation, but no private ones. In 38 counties, having 53,463 pupils enrolled in public schools, the average attendance was 46,240. The superintendent estimates the number of public schools in operation in the entire state during the period at 2,000, of which 300 were of the first, 700 of the second, and 1,000 of the third grade; number of private schools, 500; pupils enrolled in public schools, 80,000; in private schools, 12,000; average attendance in public schools, 50,500; number of teachers in public schools, 1,800; length of school term, 4 months; number of school houses, including buildings rented, 4,700; built during the year,

200; value of public school property, \$1,000,000; probable number of public schools to be in operation during the year 1873-'4, 3,000. The common school fund amounted to \$1,950,000; amount of revenue accruing to the fund from various sources provided by the constitution and laws, \$615,963 49; amount reported as arising from capitation and special county taxes, \$602,481 36; total, \$2,565,963 49. The reported expenditures were as follows: teachers' wages, \$336,345 37; salaries of school officers, \$79,381 11; school houses and contingencies, \$65,935 32; total estimated cost of conducting the schools, including normal schools, \$492,500. The average monthly wages of teachers was \$50; number of teachers' institutes held, 6; number of lectures delivered by school officers on educational topics, 127; number of school districts, 79. There are two state normal schools, devoted to the training of teachers for the colored schools. One of these is connected with Tougaloo university; the other was organized in 1870 at Holly Springs, and in 1873 had 3 instructors and 129 pupils. Each member of the legislature is en-

titled to nominate one pupil for this school, who is instructed gratuitously. In the Tougaloo school, which was established by the act of Jan. 2, 1872, each county is entitled to the free tuition of two students, to be appointed by the county superintendent of education. The beneficiaries in the normal schools are required to sign a declaration of intention to make teaching a profession and to teach in the public schools of the state for at least three years. In 1870, according to the United States census, the number of schools of all classes was 1,564, with 1,054 male and 674 female teachers, 22,793 male and 20,658 female pupils, and an annual income of \$780,339 (\$11,500 from endowment, \$167,414 from public funds, and \$601,425 from other sources, including tuition). The schools were classified as follows: classical, 19 (18 colleges and 1 academy); professional, 1 (law); technical, 1 (for the blind); day and boarding, 1,542; parochial and charity, 1. There were at that time no public schools in the state.—The statistics of the principal collegiate institutions of Mississippi for 1873-'4 are as follows:

INSTITUTIONS.	Date of organization.	Location.	Denomination.	No. of instructors.	Students.	Volumes in libraries.
University of Mississippi.....	1843	Oxford.....	None.....	18	208	5,000
Mississippi college.....	1851	Clinton.....	Baptist.....	8	163	2,000
*Pass Christian college.....	1866	Pass Christian.....	Roman Catholic.....	14	151	3,000
Alcorn university.....	1871	Oakland.....	None.....	9	170	5,000
*Tougaloo university.....	1870	Tougaloo.....	Union.....	11	250	1,000
Shaw university.....	1873	Holly Springs.....	Methodist.....	10	263	.....
*Sharon female college.....	1834	Sharon.....	Methodist.....	4	46	.....
*Columbus female institute.....	1847	Columbus.....	.....	7	100	250
Chickasaw female college.....	1850	Pontotoc.....	Presbyterian.....	6	100	2,000
Central female institute.....	1858	Clinton.....	.....	9	104	1,000
Union female college.....	1854	Oxford.....	Cumberland Presbyterian.....	9	167	.....
Whitworth female college.....	1859	Brookhaven.....	Methodist.....	11	202	.....
Meridian female college.....	1865	Meridian.....	Baptist.....	5	66	50
Franklin female college.....	1870	Holly Springs.....	Episcopal.....	5	90	250
*Starkville female institute.....	....	Starkville.....	.....	6	112	.....

The university of Mississippi, chartered in 1844, embraces three departments: preparatory education; science, literature, and the arts; and professional education. The department of science, literature, and the arts includes six courses: four undergraduate (for bachelor of arts, four years; for bachelor of science, four years; for bachelor of philosophy, three years; and for civil engineer, four years), and two post-graduate (for master of arts and for doctor of philosophy). Students in this department may also pursue selected studies. Candidates for the post-graduate degrees must have previously obtained the degree of bachelor of arts, or are required to sustain an examination in the studies requisite for that degree. The department of professional education embraces the school of law, the school of medicine and surgery (not yet organized), and the college of agriculture and the mechanic arts. The diploma of the law school, which may be obtained upon passing a satisfactory examination at the expiration of a year's attendance, entitles the recipient to practise law in any court of the

* 1872-'3.

state. The college of agriculture and the mechanic arts was established by a legislative act of 1871, which bestowed upon it two fifths of the proceeds of the 210,000 acres of land granted by congress to the state for the endowment of such an institution. The fund amounted to \$75,600. The college has a farm connected with it, and confers the degree of bachelor of scientific agriculture upon graduates of the four years' course. In the department of science, literature, and the arts, and in the college of agriculture and the mechanic arts, tuition is free to students residing in Mississippi. Students preparing for the ministry and those pecuniarily unable to pay also have their tuition fees remitted. A state scholarship of \$100 a year for four years was provided by an act of 1871 for one student from each representative district or county, to be selected by a board of examiners from pupils of the free schools. Alcorn university was incorporated by the act of May 13, 1871, which appropriated \$50,000 a year for 10 years for its support, and also bestowed upon it three fifths of the proceeds of the congressional land grant,

amounting to \$113,400, the income to be devoted to the maintenance of an agricultural and mechanical department. It occupies the site of the institution formerly known as Oakland college. The farm consists of 295 acres. There are an academic department (English), a collegiate preparatory department of two years, a collegiate department of four years (with a classical and a scientific course), and special courses in agriculture and mechanical engineering of four years. Students are admitted without distinction of color. Tuition is free to students residing in Mississippi, and there are the same state scholarships as in the university of Mississippi. In Tougaloo university primary, intermediate, and normal departments, and a theological class, have been organized. The classical department is not yet fully organized. Workshops and a farm of 500 acres are connected with the institution, which enable students to support themselves by labor wholly or in part. The number of students in the normal department in 1872-'3 was 85. Shaw university has preparatory, normal, collegiate, theological, and law departments. Tuition is free, except in the law department, the instructors being paid by the freedmen's aid society. The other institutions mentioned in the table, besides a collegiate course, have preparatory and in some cases primary departments.—The census of 1870 returns 2,788 libraries, containing 488,482 volumes, of which 2,251, with 400,106 volumes, were private. The others were classified as follows: state, 1, with 7,000 volumes; town, city, &c., 2, with 1,000; court and law, 3, with 121; college, 1, with 5,000; Sabbath school, 508, with 69,825; church, 15, with 3,000. The number of newspapers and periodicals was 111, issuing 4,703,336 copies annually, and having a circulation of 71,868, viz.: 3 daily, circulation 2,300; 6 tri-weekly, 3,650; 3 semi-weekly, 2,400; 92 weekly, 60,018; 2 semi-monthly, 700; 5 monthly, 2,800. They were classified as follows: agricultural and horticultural, 3; benevolent and secret societies, 1; commercial and financial, 4; illustrated, literary, and miscellaneous, 2; political, 97; religious, 3; technical and professional, 1. The statistics of churches for 1870 are as follows:

DENOMINATIONS.	Number of organizations.	Edifices.	Sittings.	Value of property.
Baptist.....	665	652	174,970	\$582,325
Christian.....	30	25	7,325	50,550
Congregational.....	2	1	800	1,200
Episcopal.....	83	33	8,650	203,000
Lutheran.....	10	10	2,450	12,300
Methodist.....	787	776	208,203	854,475
Presbyterian, regular.....	181	180	51,700	376,200
" other.....	81	78	19,400	94,000
Roman Catholic.....	27	27	8,250	165,850
Universalist.....	1	1	400	800
Union.....	12	14	3,750	19,800
Total.....	1,529	1,500	455,398	\$2,360,500

—De Soto and his companions were the first Europeans who traversed this region. They made no settlements, and the death of the leader in 1542 put an end to the expedition. In 1682 La Salle descended the Mississippi, took formal possession of the adjacent country for the king of France, and called it Louisiana. In 1698 Iberville was authorized by the French king to colonize the regions of the lower Mississippi. He landed on Ship island, and in 1699 erected a fort at the bay of Biloxi, about 80 m. E. of the site of New Orleans. In 1716 Fort Rosalie was erected on the site of Natchez. The colonies grew slowly, and New Orleans, being founded soon after, attracted many of the settlers. In 1728, 1733, and 1752 the settlements suffered much from Indian hostilities. After the cession of the E. part of Louisiana (including what is now Mississippi) to Great Britain in 1763, and until the revolutionary war, immigration into the territory proceeded slowly. The territory of Mississippi was formed by the act of congress of April 7, 1798, being bounded N. by a line drawn due E. from the mouth of the Yazoo river to the Chattahoochee, E. by the Chattahoochee, S. by the 31st parallel, and W. by the Mississippi river. By the act of March 27, 1804, the region N. of these limits and S. of Tennessee, which had been ceded to the United States by Georgia in 1802, was added, and Mississippi territory thus comprised the whole of the present states of Alabama and Mississippi N. of the 31st parallel. The region S. of that parallel, between the Pearl and Perdido rivers, was added by the act of May 14, 1812, having been taken possession of by the United States in 1811 as a part of the Louisiana purchase of 1803, though claimed by Spain. Alabama territory was formed from the E. portion by the act of March 3, 1817, and by a joint resolution of Dec. 10 of the same year Mississippi was admitted into the Union as a state. In 1832 a new constitution was adopted. At the presidential election in November, 1860, 3,283 votes were cast for Douglas, 40,797 for Breckenridge, and 25,040 for Bell. Immediately after the election of Lincoln became known, the governor called an extra session of the legislature, which met on Nov. 26, and provided for an election on Dec. 10 of delegates to a convention to assemble on Jan. 7, 1861. On Jan. 9 this convention passed an ordinance of secession by a vote of 84 to 15, and on March 30 ratified the constitution of the Confederate States by a vote of 78 to 7, a resolution to submit it to a vote of the people having been rejected. The first movement of the federal troops in the state was the capture of Biloxi and the removal of a battery of two guns by a force from Ship island, on Dec. 31, 1861. During 1862 the N. portion of the state was the theatre of operations. After the battle of Shiloh the confederates retired to Corinth. The federal troops subsequently advanced in force under Gen. Halleck, the town was evacuated, and the fed-

erals took possession on May 30. On Sept. 19 a sharp engagement took place near Iuka between the confederates under Gen. Price and the federals under Gen. Rosecrans, which resulted in the evacuation of that place by the confederates during the following night. Price, joined by other forces, made an attack on Corinth on Oct. 3 and 4, but was repulsed with heavy loss. (See CORINTH.) The most important operations in 1863 were those resulting in the surrender of Vicksburg on July 4. (See VICKSBURG.) Subsequent military movements were of minor importance. On May 18, 1865, the legislature assembled under a call of the governor, and ordered an election on June 19 of delegates to a convention to meet on July 3. But on June 13 President Johnson appointed William L. Sharkey provisional governor, who immediately entered upon the duties of his office, and on July 1 ordered an election, to be held on Aug. 7, of delegates to a convention, those being entitled to vote who were qualified electors under the laws in force prior to secession, and who had taken the amnesty oath prescribed by the proclamation of the president of May 29. The convention met Aug. 14. On the 21st the constitution was amended by abolishing slavery, and on the following day the ordinance of secession was repealed. On Oct. 2 an election of state officers and congressmen was held, which resulted in the choice of Benjamin G. Humphreys as governor. The legislature elected at this time assembled on the 16th, and subsequently chose United States senators. But the congressmen and senators were not admitted to their seats. By the congressional reconstruction acts of 1867, Mississippi with Arkansas was constituted the fourth military district, under command of Maj. Gen. E. O. Ord. A registration was ordered, and on Nov. 5 an election was held to determine the question of calling a convention and for the choice of delegates to the same, which resulted in 69,739 votes for and 6,277 against a convention. On Dec. 28 Gen. Ord was directed to turn over his command to Gen. A. C. Gillem. The convention assembled on Jan. 7, 1868, and remained in session till Jan. 18, when it adjourned after adopting a constitution. On June 4 Gen. Irwin McDowell assumed command of the fourth district, and on the 16th appointed Maj. Gen. Adelbert Ames provisional governor of Mississippi, in place of Gov. Humphreys. At an election held on June 22 the constitution was rejected by a vote of 56,231 to 63,860. In July Gen. Gillem relieved Gen. McDowell. Soon after the inauguration of President Grant (March 4, 1869) Gen. Ames was appointed to the command of the district. On April 10 an act of congress was passed authorizing the president to submit the constitution again to a vote of the people, with such clauses separate as he might deem proper. A proclamation of July 13 appointed Nov. 30 as the day of election, and designated certain clauses for a separate

vote, the most important of which were those disfranchising and disqualifying from holding office persons who had taken part against the Union in the civil war. The constitution was ratified almost unanimously, and the objectionable clauses were rejected. At the same time James L. Alcorn, republican, was elected governor over Louis Dent, conservative, by a vote of 76,186 against 38,097. The legislature met on Jan. 11, 1870, and shortly after ratified the 14th and 15th amendments to the constitution of the United States. On Feb. 23 an act was passed by congress for the readmission of the state into the Union, and on March 10 Gov. Alcorn was inaugurated and the civil authorities assumed control.—See "Report on the Geology and Agriculture of the State of Mississippi," by Eugene W. Hildgard (Jackson, 1860).

MISSISSIPPI. I. A N. E. county of Arkansas, bordering on Missouri, separated on the E. from Tennessee by the Mississippi river, bounded W. by the St. Francis river and Lake St. Francis, and intersected by Little river; area, 1,080 sq. m.; pop. in 1870, 3,633, of whom 971 were colored. The surface is low and level, and in the drier portions very fertile, and there are several lakes, the largest of which is Big lake. The chief productions in 1870 were 120,700 bushels of Indian corn, 11,196 of potatoes, and 3,587 bales of cotton. There were 695 horses, 465 mules and asses, 1,347 milch cows, 2,941 other cattle, 583 sheep, and 6,263 swine. Capital, Osceola. II. A S. E. county of Missouri, bounded N. E. and S. by the Mississippi river, which separates it from Illinois and Kentucky, and drained by James and Cypress bayous; area, 360 sq. m.; pop. in 1870, 4,982, of whom 919 were colored. The surface is level and the soil very fertile. The St. Louis and Iron Mountain railroad passes through it. The chief productions in 1870 were 5,225 bushels of wheat, 491,990 of Indian corn, 4,593 of oats, and 57 bales of cotton. There were 853 horses, 692 mules and asses, 1,172 milch cows, 2,814 other cattle, 659 sheep, and 14,588 swine. Capital, Charleston.

MISSISSIPPI RIVER (Indian, *Miche Sepe*, as spelled by some old writers, and translated the "Great River" and "the Great Father of Waters"), the principal river of North America, and, in connection with its largest tributary the Missouri, the longest river in the world, except perhaps the Nile. It drains the greater part of the territory of the United States lying between the Alleghany and Rocky mountains, a region nearly half as large as Europe. The true Mississippi river begins at the confluence of the Missouri and the Upper Mississippi. It has eight principal tributaries, which, in the order of the extent of the regions drained by them, are the Missouri, Ohio, Upper Mississippi, Arkansas, Red, White, Yazoo, and St. Francis. The source of the Mississippi, according to Schoolcraft, who visited it in 1832, is a lake called by him Itasca, by the Chippewa

Indians Omoshkos Sagaigon, and by the French traders Lac la Biche. It is a beautiful sheet of water, clear and deep, about 7 m. long and 1 m. to 3 m. wide, in lat. $47^{\circ} 14' N.$, lon. $95^{\circ} 2' W.$, about 1,575 ft. above the sea. Five creeks fall into Lake Itasca, the principal one of which has its origin about 6 m. distant, in a pond formed by water oozing from the bases of the hills known as Hauteurs de Terre, which are about 100 ft. high. The Mississippi at the outlet of the lake is 10 or 12 ft. wide and 18 in. deep, and flows N. E. over petty falls and rapids through a series of small lakes and marshes till it reaches Lac Travers, its most northern point. This is a beautiful sheet of water from 10 to 12 m. long and from 4 to 5 m. wide, surrounded by wooded hills sloping to a beach of pure white sand. From Lac Travers the river flows S. E. and S., and in the first 25 m. is broken into a series of small rapids, from the foot of which it flows with an even current 40 or 50 yards wide and from 2 to 6 ft. deep to Cass lake, which has an area of about 120 sq. m.; thence S. through a series of savannas, separated by several lakes, to the falls of Peckagama, where it is compressed into a channel 80 ft. wide. Here the river rushes down a rugged bed of sandstone 20 ft. in 300 yards. Below these falls the river is very crooked, and averages about 40 yards in width. It is broken by six rapids between Swan and Sandy Lake rivers. Savanna river enters the Sandy lake, and is the main canoe route between the Mississippi and Lake Superior. From the outlet of Sandy lake to Pine river, 100 m., the river presents several rapids and islands, and receives a number of small tributaries. Crow Wing river, the largest tributary above the falls of St. Anthony, is nearly equal to the Mississippi itself. The Elk river, the Little falls, Big falls, Prairie rapids, and St. Francis river follow in the order named; and finally the falls of St. Anthony are reached, where the river pitches over a perpendicular face of sandstone 18 ft. high. An island at the brink of the falls divides the current into two channels, the largest of which flows by the west side, and affords a great water power. Including the rapids above and below the falls, the entire descent of the river is about 65 ft. within three quarters of a mile. These falls are about 2,200 m. from the gulf of Mexico, and constitute the natural head of steamboat navigation; but small vessels ply regularly above the falls for several hundred miles, according to the stage of water. The next natural obstruction to navigation below the falls of St. Anthony are the Rock Island rapids, extending from Leclaire to the cities of Rock Island and Davenport, a distance of 14 m. The descent is 24 ft. at extreme low water. The bed of the river throughout the rapids is stratified limestone, more or less folded, and forming chains or barriers which extend entirely across the channel at six or seven points. In 1866 congress directed the removal of these chains, and also

the improvement of the lower or Des Moines rapid, 130 m. below the upper rapid, and between Montrose and Keokuk. The length of the latter is 12 m., and the descent 23 ft. at low water. Before the improvements were undertaken, there was about 11 m. of deep water and good navigation on the upper rapids, and only $3\frac{1}{4}$ m. on the lower rapids. The duty of devising plans for the improvement of the rapids was assigned to Gen. J. H. Wilson, U. S. A., who recommended that the obstruction at the upper rapids should be removed mainly by the use of coffer dams (see DAM, vol. v., p. 650), and that the lower rapids should be improved by similar means, supplemented by a lateral canal 7 m. long, 300 ft. wide, and having three locks each 80 ft. wide and 350 ft. long. A board of engineers approved these plans, and congress ordered them to be carried into effect. The improvements, under the supervision of Gen. Wilson and his successor Col. Macomb, have been pushed forward as fast as the appropriations would permit, and are now (November, 1874) almost completed at the upper rapids, while four fifths of the work has been done at the lower rapids. The improvements will cost about \$5,000,000, and when completed will enable the largest boats to pass the rapids, whenever they can reach them either from above or below. But the navigation of the entire Upper Mississippi is rendered very difficult during the dry season by the frequent recurrence of sand bars; and although the government has done something by the use of dredge boats and wing dams to deepen the water on the worst of these, no systematic plan of improvement has yet been devised or can be carried out till a much denser and richer population shall inhabit the regions to be benefited. But it is safe to say that between the falls of St. Anthony and the mouth of the Ohio there is water enough at the driest season, if properly regulated and controlled, to give a navigable depth of 6 ft. and ample width for all uses to which it can be put.—The Mississippi river, from the mouth of the Missouri to the gulf, is 1,286 m. long; from the source of the Upper Mississippi, 2,616 m. The distance from the Madison fork source of the Missouri to the gulf is 4,194 m., and from the head of the Ohio river at Clouderport, Pa., to the gulf, 2,551 m. The numerous branches of the navigable waters connected with the Mississippi penetrate all the states and territories between the Rocky and Alleghany mountains. The capacity of these branches for navigation has been as yet only partially developed, but a careful compilation shows that they constitute a natural system of water communication having an aggregate extent of about 15,000 m.—The following table, taken from Humphreys and Abbot's "Report upon the Hydraulics of the Mississippi River" (4to, Philadelphia, 1861), shows the area of the basins, downfall of rain, and annual drainage of the Mississippi and its principal tributaries:

BASIN.	Area, square miles.	Annual downfall, in cubic feet.	Annual drainage, in cubic feet.	Ratio.
Ohio river.....	214,000	20,700,000,000,000	5,000,000,000,000	0·24
Missouri river.....	513,000	23,200,000,000,000	3,780,000,000,000	0·15
Upper Mississipp.....	169,000	13,800,000,000,000	3,300,000,000,000	0·24
Small tributaries.....	32,400	3,600,000,000,000	3,240,000,000,000	0·90
Arkansas and White rivers.....	189,000	13,000,000,000,000	2,000,000,000,000	0·15
Red river.....	97,000	8,800,000,000,000	1,800,000,000,000	0·20
Yazoo river.....	13,850	1,500,000,000,000	1,350,000,000,000	0·90
St. Francis river.....	10,500	1,100,000,000,000	9,900,000,000,000	0·90
Entire Mississippi exclusive of Red river.....	1,147,000	75,900,000,000,000	15,900,000,000,000	0·25

Below the mouth of Red river, the Mississippi is divided into numerous arms or passes, each of which pursues an independent course to the gulf. The highest of these is the Atchafalaya on the W. side of the river. Below its point of separation from the Mississippi the region of swampy lands, of bayous and creeks, is known as the delta. Above this the alluvial plain of the river extends to the Chains, 30 m. above the mouth of the Ohio, and to Cape Girardeau in Missouri, where precipitous rocky banks are first met with. These are the lower secondary limestone strata lying in nearly horizontal beds. The total length of the plain from the mouth of the Ohio to the gulf is estimated at 500 m. Its breadth at the upper extremity varies from 30 to 50 m.; at Memphis it is about 30 m., and at the mouth of White river 80 m. The extreme width of the delta is rated at 150 m., its average width is probably 90 m., and its area 12,300 sq. m. The elevation of the bottom lands at Cairo above the sea level is about 310 ft., while the slope of the high-water surface from that place to the gulf is from 322 to 0. These bottom lands are subject to inundation, and consequent annual enrichment. Under the system of slave labor large plantations were opened in the dense forests which cover them, but vast tracts of unsurpassed fertility are yet covered with canebrakes and cypress. The alluvial plain, extending from above Cairo to the gulf, is terminated on the east and the west by a line of bluffs of irregular height and direction, composed of strata of the eocene and later tertiary formations. Down this plain the river flows in a serpentine course, frequently washing the base of the hills on the E. side, as at Columbus, Randolph, Memphis, Vicksburg, Grand Gulf, Natchez, and Baton Rouge, and once passing to the opposite side at Helena. The actual length of the river from the mouth of the Ohio to the gulf is 1,097 m., increasing the distance in a straight line by about 600 m., and by its flexures also reducing the rate of its descent to less than half the inclination of the plain down which it flows. The range between high and low water at Cairo, near the head of the plain, is 51 ft., and at New Orleans it is 14·4 ft. The river flows in a trough about 4,470 ft. wide at the head, and 3,000 ft. at the foot. The immense curves of the stream in its course through the alluvial plain sweep around in half circles, and the river sometimes, after

traversing 25 or 30 m., is brought within a mile or less of the place it had before passed. In heavy floods the water occasionally bursts through the tongue of land, and form what is called a "cut-off," which may become a new and permanent channel. The height of the banks and the great depth of the river bed check the frequent formation of these cut-offs, and attempts to produce them artificially have often failed, especially when the soil is a tough blue clay, which is not readily worn away by flowing water. This was the case at Bayou Sara, where in 1845 an excavation intended to turn the river was made, by which a circuit of 25 m. would have been reduced to a cut of one mile; and also at Vicksburg in 1862-'3, where the Union army endeavored to make a cut-off out of range of the confederate guns. Semicircular lakes, which are deserted river bends, are scattered over the alluvial tract. These are inhabited by alligators, wild fowl, and gar fish, which the steamboats have nearly driven away from the main river. At high water the river overflows into these lakes. The low country around is then entirely submerged, and extensive seas spread out on either side, the river itself being marked by the clear broad band of water in the midst of the forests that appear above it. The great freshets usually occur in the spring, and are often attended with very serious consequences. Crevasses are formed in the banks and increase with the flow, which becomes so violent that boats are occasionally carried with their crews into the intricacies of the bayous which lead the waters to the streams at the foot of the bluffs.—The lower portion of the alluvial plain, called the delta, rises from a few inches to 10 ft. only above the level of the sea, and is formed of sands and clays in horizontal layers. The delta protrudes into the gulf of Mexico far beyond the general coast line, and is slowly but imperceptibly advancing into the gulf by the shoaling caused by the deposition of the sediment brought down the river. This is mostly dispersed by the waves and currents, and distributed over the bottom of the gulf. Although the banks of the passes are sometimes observed to have advanced in the course of a few years sensibly into the gulf, these are but narrow strips of land, which may be swept away by the rush of the gulf waters driven up by storms, leaving the long coast of the delta but slightly changed. The old French maps of the early part of the last century still very cor-

very variable, sometimes reaching 150 ft., but the maximum is more commonly from 120 to 130 ft. The mean depth at high-water mark is about the same at Carrollton and at Natchez, 300 m. further up. A section of the river at Carrollton, made at high-water mark in 1858, comprises 184,000 square feet, and at Natchez 221,000. The mean rate of descent varies at low water from .005 of a foot per mile at the head of the passes, to .578 of a foot at Cairo, and in high-water from .115 of a foot to .497 of a foot per mile. The velocity varies at Carrollton from 1.45 to 2.61 m. per hour, according to the stage of the water and the direction of the wind.—The Mississippi, like the other great rivers of the west, is continually gathering into its current numbers of trees, as the banks upon which they grew are undermined. They are frequently left in the main channels, their roots fixed to the bottom, and their tops pointing down stream. In this condition they are known as snags and sawyers, and present to boats ascending the river, especially at night, a most dangerous obstruction. But continual care is now given to the removal of these obstructions. The accumulations of the drift materials in the arms of the river have sometimes been so great as to bridge these over and extend for miles up the current. The obstruction is then known by the name of raft. From about the year 1778 such an accumulation had been gathering in the Atchafalaya, until in 1816 it had extended to full 10 m. in length, over 600 ft. in width and about 8 ft. in depth. Though rising and falling with the water, it afforded a soil for the growth of bushes and of trees, some of which reached the height of 60 ft. In 1835 the state of Louisiana took measures to have it removed, and this was finally accomplished at a heavy cost in the course of four years. The Red river raft is still more famous for the large sums which have been appropriated by congress to effect its removal, the work upon which has been carried on with great success of late years, and is now almost completed. The appropriations made from time to time by congress for the Mississippi river comprise the following items:

[illegible]

—For a full statement of measurements, all the phenomena, physical elements, and laws relating to this great river, see the "Report upon the Physics and Hydraulics of the Mississippi River," prepared by Capt. A. A. Humphreys and Lieut. H. L. Abbot, U. S. army (4to, Philadelphia, 1861), and also the official reports of the chief of engineers to the war department.—The first European explorer

of the Mississippi valley was De Soto, who with his party reached the river in June, 1541, as is supposed not far below the site of Helena in Arkansas. (See De Soto.) In 1673 Marquette and Joliet descended the river to within three days' journey of its mouth. La Salle in 1682 descended the river to the gulf of Mexico, and took possession of the country in the name of the king of France. About the year 1699 Iberville built a fort upon the banks of the river, and in 1703 the settlement of St. Peter's was made upon the Yazoo branch. New Orleans was laid out in 1718, and levees were immediately commenced, which were completed in front of the city ten years afterward. At that time the levee system of lower Louisiana was fully established.

MISSOLOGHI, or *Mesolonghi*, a town of Greece, capital of the united nomarchy of Acarnania and *Ætolia*, 24 m. W. of Lepanto, on the N. side of the gulf of Patras; pop. about 6,000. It stands in a level plain 18 m. long and 4 m. broad, watered by the *Achelous* and *Evenus*, and extending from the base of Mt. *Aracynthus* to the gulf. The walls are washed by the sea, but the water is so shallow that nothing larger than a small fishing boat can approach nearer than 4 or 5 m. *Missolonghi* is the most important strategical point of western Greece, and is famous for the sieges it has sustained. In 1804 it fell under the dominion of Ali Pasha. In 1821 it joined in the revolt against the Turks, and on Nov. 5 *Mavrocordato* and *Marco Bozzaris* threw themselves with 400 men into the place, which was almost deserted and scarcely defensible, the fortifications consisting only of a low and ruinous wall, without bastions, and a small ditch in many places filled with rubbish. With only 14 old guns and scanty ammunition, *Mavrocordato* made a brilliant defence for more than two months against a Turkish army of 14,000. On Nov. 23 the Greeks succeeded in throwing in reinforcements by sea, and the Turks were compelled to raise the siege, Jan. 6, 1823. The town was then fortified under the direction of English officers, at the expense of an Englishman named *Murray*, and became one of the strongest places in Greece. From September to December, 1823, *Missolonghi* was blockaded for 59 days by the Turks, who besieged the neighboring *Anatolico*, and was defended by *Constantine Bozzaris*, until relieved by *Mavrocordato*. Lord *Byron* reached *Missolonghi* Jan. 5, 1824, and died there April 19. The last and greatest siege of *Missolonghi* began in April, 1825, when *Reshid Pasha* invested it with a large army, which was reinforced in July by the arrival of a powerful fleet, and in January, 1826, by *Ibrahim Pasha* with an army of 20,000 Egyptians. The garrison of 5,000 Greeks, commanded by *Noto Bozzaris*, made a desperate defence, repulsing repeated assaults, and, though suffering terribly from want of provisions, refused to capitulate, notwithstanding repeated offers of the most favorable terms.

When continual bombardment had reduced the town to a heap of ruins and the last of their food had been consumed, at midnight of April 22, 1826, the garrison, placing the women in the centre, sallied forth in a body, and cutting their way through the Turkish camp gained the mountains, to the number of about 2,000. Those who were too feeble to join in the sortie assembled in a large mill which was used as a powder magazine, and when the Turks entered the town blew themselves up together with a large number of the enemy. The town has been rebuilt of late years, but the fortifications are decayed. *Marco Bozzaris* is buried here, and a statue in white marble, presented in 1835 by the French sculptor *David*, has been erected over his grave. Near this monument is a mound of earth with an inscription commemorative of other victims of the war. *Byron's* remains were conveyed to England, but his heart, which was deposited in a silver box in a mausoleum erected to his honor, was lost in the confusion of the sortie of 1826.

MISSOULA, the N. W. county of Montana, bounded N. by British America and W. and S. by Idaho; area, 20,400 sq. m.; pop. in 1870, 2,554. It lies mostly between the Bitter Root and Rocky mountains, contains the head waters of *Clarke's* fork of the *Columbia*, and is intersected in the N. W. by the *Kootenay* river. *Flathead* lake, 10 m. wide and 25 m. long, is the only important lake in the territory. Gold is found, and the census of 1870 returns 68 placer mines as in operation. The chief productions were 32,436 bushels of wheat, 15,836 of oats, 1,534 of barley, 12,152 of potatoes, 12,925 lbs. of butter, and 956 tons of hay. There were 1,045 horses, 1,134 milch cows, 1,373 other cattle, and 874 swine; 3 flour mills, and 4 saw mills. Capital, *Missoula*.

MISSOURI, a central state of the American Union, and the 11th admitted under the federal constitution, situated between lat. 36° and 40° 30' N., and lon. 89° 2' and 95° 42' W.; length N. and S. 277 m.; average breadth about 244 m., varying from 208 m. in the north to 312 m. in the south; area, 65,350 sq. m., including a narrow strip between the *St. François* and *Mississippi* rivers, extending beyond the general body of the state $\frac{1}{4}$ ° southward between *Arkansas* and *Tennessee*. *Missouri* is bounded N. by *Iowa*; E. by *Illinois*, *Kentucky*, and *Tennessee*, from which the *Mississippi* river divides it; S. by *Arkansas*; and W. by *Indian* territory, *Kansas*, and *Nebraska*, from which it is divided by a N. and S. line on the meridian of the mouth of *Kansas* river, and thence N. by the main channel of the *Missouri* river. The state is divided into 114 counties, viz.: *Adair*, *Andrew*, *Atchison*, *Audrain*, *Barry*, *Barton*, *Bates*, *Benton*, *Bollinger*, *Boone*, *Buchanan*, *Butler*, *Caldwell*, *Callaway*, *Camden*, *Cape Girardeau*, *Carroll*, *Carter*, *Cass*, *Cedar*, *Chariton*, *Christian*, *Clarke*, *Clay*, *Clinton*, *Cole*, *Cooper*, *Crawford*, *Dade*, *Dallas*, *Daviess*, *De Kalb*, *Dent*, *Douglas*, *Dunklin*, *Franklin*, *Gasconade*, *Gentry*, *Greene*, *Grun-*

dy, Harrison, Henry, Hickory, Holt, Howard, Howell, Iron, Jackson, Jasper, Jefferson, Johnson, Knox, La Clede, Lafayette, Lawrence, Lewis, Lincoln, Linn, Livingston, McDonald, Macon, Madison, Maries, Marion, Mercer, Miller, Mississippi, Montean, Monroe, Montgomery, Morgan, New Madrid, Newton, Nodaway, Oregon, Osage, Ozark, Pemiscot, Perry, Pettis, Phelps, Pike, Platte, Polk, Pulaski, Putnam, Ralls, Randolph, Ray, Reynolds, Ripley, St. Charles, St. Clair, St. François, Ste. Genevieve, St. Louis, Saline, Schnyler, Scotland, Scott, Shannon, Shelby, Stoddard, Stone, Sullivan, Taney, Texas, Vernon, Warren, Washington, Wayne, Webster, Worth, Wright. Jefferson City, the capital, is near the central part



State Seal of Missouri.

of the state, on the Missouri river, 125 m. by rail W. of St. Louis; its population in 1870 was 4,420. The other important cities are Booneville, with 3,506 inhabitants in 1870; Cape Girardeau, 3,585; Hannibal, 10,125; Independence, 3,184; Kansas City, 32,260; Lexington, 4,373; Louisiana, 3,639; Macon, 3,678; St. Charles, 3,479; St. Joseph, 19,565; St. Louis, 310,864; Sedalia, 4,560; and Springfield, 5,555.—The population of Missouri, according to the federal census, has been as follows:

YEARS.	White.	Free colored.	Slaves.	Total population.	Rank.
1810.....	17,227	607	8,011	20,845	22
1820.....	55,983	376	10,222	66,586	23
1830.....	114,795	569	25,091	140,455	21
1840.....	323,888	1,574	58,240	383,702	16
1850.....	562,004	2,613	87,422	652,044	13
1860.....	1,063,489	3,872	114,981	1,182,012	8
1870.....	1,608,146	118,071	.....	1,721,295	5

Included in the population in 1870 were 3 Chinese and 75 Indians. Of the total population in that year, 896,347 were males and 824,948 females; 1,499,028 were of native and 222,267 of foreign birth. Of the natives, 874,006 were born in the state, 72,623 in Illinois, 51,803 in Indiana, 22,456 in Iowa, 102,661 in Kentucky, 31,805 in New York, 18,755 in North Carolina, 76,062 in Ohio, 35,384 in Pennsylvania,

70,212 in Tennessee, and 61,306 in Virginia and West Virginia. The foreign population comprised 8,448 born in British America, 6,293 in France, 113,618 in Germany, 14,314 in England, 54,983 in Ireland, 3,283 in Scotland, 2,302 in Sweden, and 6,597 in Switzerland. The density of population was 26.34 persons to a square mile. There were 316,917 families, with an average of 5.43 persons to each, and 292,769 dwellings, with an average of 5.87 persons to each. The increase of population from 1860 to 1870 was 45.62 per cent. The number of male citizens 21 years old and upward was 380,235; persons from 5 to 18 years old, 577,803; number attending school, 324,348. There were 146,771 persons 10 years old and upward who could not read, and 222,411 who could not write, the latter number comprising 206,827 of native and 15,584 of foreign birth, 161,763 white, 60,622 colored, and 26 Indians, 105,767 males, and 116,636 females. Of the total population 10 years old and over, 18.45 per cent. were illiterates; number of illiterates 21 years old and over, 124,508, of whom 84,904 were white, 38,589 colored, and 15 Indians, 52,788 males, and 70,717 females. The number of paupers supported during the year ending June 1, 1870, was 2,424, at a cost of \$191,171. Of the total number (1,854) receiving support June 1, 1870, 1,415 were native, of whom 1,090 were white and 325 colored, and 439 were foreigners. The number of persons convicted of crime during the year was 1,503. Of the total number (1,623) in prison June 1, 1870, 1,217 were natives and 406 foreigners; of the former 893 were white and 324 colored. The state contained 904 blind, 790 deaf and dumb, 1,263 insane, and 779 idiotic. Of the total population 10 years old and upward (1,205,568); there were engaged in all occupations 505,556; in agriculture, 263,918, of whom 86,807 were laborers, and 174,961 farmers and planters; in professional and personal services, 106,903, including 1,739 clergymen, 29,338 domestic servants, 47,462 laborers not specified, 3,452 lawyers, 3,560 physicians and surgeons, and 4,117 teachers not specified; in trade and transportation, 54,885, of whom 9,681 were clerks in stores, 6,390 draymen, hackmen, teamsters, &c., 7,710 employees of railroad companies (not clerks), and 4,757 traders and dealers not specified; and in manufactures and mechanical and mining industries, 79,850. The total number of deaths during the year was 27,982, being 1.63 per cent. of the population. There were 990 deaths from cholera infantum; 2,717 from consumption, there being 10.3 deaths from all causes to 1 from that disease; croup, 719; measles, 869; pneumonia, 2,800, there being 10 deaths from all causes to 1 from that disease; smallpox, 1,034; diphtheria and scarlet fever, 1,405; intermittent and remittent fever, 1,052; enteric fever, 1,395; diarrhoea, 1,800.—The Missouri river divides this state into two distinct parts. The S. part is undulating, rising into mountains as it approaches the Ozark

range. That portion N. of the river is more level. An extensive bottom land lies along the Mississippi, commencing on the N. at Cape Girardeau and extending S. to the Arkansas river. It includes many swamps which are rendered almost impenetrable by a dense growth of trees, mostly cypress. The most extensive of these, called the Great swamp, commences a few miles S. of Cape Girardeau and passes S. to the mouth of the St. François, penetrating far into the state of Arkansas. More than 100 m. of this swamp are in Missouri. Within the bottom are also many lakes and lagoons; but it likewise contains many islands elevated above the reach of the highest floods. Since the earthquakes of 1811-12 much of this tract has been inundated; but it is capable of being reclaimed, and has a very fertile soil. The highlands along the Mississippi begin below Cape Girardeau, and extend to the mouth of the Missouri. Between Ste. Genevieve and the Meramec the banks, composed of solid masses of limestone, rise occasionally 360 ft. above the water. This high and undulating country extends across the entire breadth of the state, its rugged character disappearing as the Osage river is approached. This is one of the least populous sections of the state, but it is exceedingly picturesque. It has a mild, dry, and genial climate. Between the Gasconade and Osage, both of which are affluents of the Missouri, a range of low hills approaches that river, rising from 150 to 200 ft. above its mean level. They are thinly wooded, and constitute the northernmost offset of the Ozark mountains, a region of which the undulating country on the east may be considered as the lowest portion. This elevated tract covers more than half of that portion of the state S. of the Missouri. The surface is extremely broken and hilly; the hills, which rise from 500 to more than 1,000 ft. above their bases, are exceedingly numerous, but do not form continuous ranges, being divided into knobs and peaks with rounded summits, and presenting perpendicular cliffs and abrupt precipices of sandstone. The soil covering them is generally shallow, and overgrown almost exclusively with oak, and in the S. counties with pine and cedar. West of this region the country, especially the basin of the Osage, is chiefly a rolling prairie, diversified with forests of stunted timber; and to the north, along both sides of the Missouri, extends a rich alluvial bottom. In the country N. of the Missouri, which comprehends about one third of the state, the surface is generally rolling or level. The bottoms along the Missouri and Mississippi are remarkably fertile. Between these rivers the country is much diversified by the broad valleys of their subsidiary streams, and intervening tracts of undulating upland which are united with the valleys by gentle slopes. The woodlands occur only on the margins of the watercourses, and the uplands are extensive prairies completely destitute of timber. These prairies occupy at least nine

tenths of the whole region, and comprehend some of the best lands of the state.—The two principal streams are the Missouri, traversing the state from the N. W. corner to the middle of its E. boundary, and the Mississippi, forming its entire E. boundary, both navigable the whole year except when blocked with ice. The Osage, the next largest stream, is navigable for small steamboats half the year. Next in importance are the St. François, White, Black, Current, Gasconade, Grand, and Chariton rivers, all navigable for small boats a few weeks in early summer. The other principal streams, not navigable, are Salt, Fabius, South Grand, Platte, Nodaway, Spring, Sac, Niangua, Piney, Maramec, Cuivre, and Castor rivers.—The soils of Missouri may be divided into four classes, referred each to its particular district. The first class comprises all the bottom lands and the swamps of S. E. Missouri, which latter include seven or eight counties, comprising large tracts of some of the richest lands in the world, yielding often 75 to 100 bushels of corn per acre. The S. E. counties produce fine crops of cotton. The next richest bodies of land yield 50 to 75 bushels of corn per acre on uplands, and include all N. W. Missouri, with five counties S. of Missouri river. This district is mostly underlaid by the upper coal measures, and for most farming purposes is the most desirable part of the state. The third class, or second class of upland soil, includes the remainder of N. and the border counties in S. W. Missouri. In these counties 30 to 50 bushels of corn per acre are produced, and in the east they give a larger yield of wheat per acre than any others of the state. The poorest class of soils is found on all the hills of southern Missouri, where the yield is rarely over 20 to 40 bushels of corn per acre. This part of the state is 1,200 to 1,500 ft. above the sea, and chiefly underlaid by primordial sandstones and magnesian limestones, with occasional porphyry or granite peaks in the eastern part, which sometimes rise 300 to 400 ft. above the unaltered magnesian limestones, but their tops are probably not more than 1,500 ft. above the sea. While N. and W. Missouri has a gently undulating or rolling surface, with hills not often over 50 ft., and distant ridges 250 ft. high, in S. Missouri the stream channels have cut out their valleys 200 to 300 ft. below the hill-tops, and often 400 ft. below the tops of distant ridges. Where the main streams are distant, the country spreads out into a flat table land. South of the main Ozark ridge, where the hills are covered with either sandstone or chert, are extensive pine forests. The streams that traverse this portion of the state are clear, cool, and swift-running, and afford excellent water power. S. E. Missouri is heavily timbered, especially the swamp counties, which contain heavy forests of walnut, oak, cypress, poplar, gum, and sycamore. N. and W. Missouri is chiefly prairie, the timber being confined to narrow belts along the streams. The

prairies afford excellent pasturage, and where they are grazed down a fine growth of blue grass takes the place of the original wild grass.

—The geological formations include the coal measures, 1,950 ft.; lower carboniferous, including Chester group, 300 ft.; ferruginous sandstone, 100 ft.; St. Louis limestone, 250 ft.; Keokuk group, 200 ft.; Burlington group, 300 ft.; and Chouteau group, 230 ft. The Devonian is represented by the Hamilton and Onondaga, 100 ft.; the upper Silurian by the Oriskany, 30 ft., Delthyris shale, 350 ft., Niagara group, 225 ft., and Cape Girardeau limestone, 50 ft. The lower Silurian includes the Cincinnati group, 100 ft., Trenton and Black river limestone, 400 ft., and magnesian limestone series, about 1,500 ft.; the latter includes 300 to 400 ft. of sandstone excellent for glass making. The southern part of Missouri, including the Ozark ridge and most of the state S. of the Missouri and Osage rivers, excepting the two western tiers of counties, is from 1,000 to 1,400 ft. above the sea, and includes lower Silurian rocks, flanked by lower carboniferous. On the W. flank, near the state line, the country is not often over 800 ft. above the sea. On the W. and N. flank of this highland the coal measures commence. On the S. side of the Missouri river are found the middle and lower coal, not over 800 or 900 ft. above the sea. In N. Missouri the same formations are about 800 to 1,000 ft. above the sea. The elevation of the eastern and southern outcrop of the upper coal measures, near the base, is 875 to 990 ft. Toward the northern part of the state the upper measures are more elevated, and may reach from 1,000 to 1,100 ft. above the sea. The coal measures being composed of alternations of shales, sandstones, and limestones, their topography is such as would result from decomposition of such rocks. In no place has any limestone been observed of greater thickness than 30 ft., and the sandstones often pass into shales; so the topography of the coal formations is nowhere very rugged. Along the line of outcrop of the limestones are sometimes seen steep and rugged hillsides, occurring from Cass county on the south, through Jackson, Platte, Clay, Ray, Caldwell, Daviess, Gentry, Worth, and Harrison counties. N. and W. of this are the upper measures, including alternations of thick and thin strata of limestone, with sandstones, shales, and clays; the resultant being the undulating and rolling portion of N. W. Missouri. The Missouri bluffs, in the region of the upper coal measures, attain an elevation of 250 to 330 ft. above the Missouri bottoms, and the inland ridges are but little higher. The summits of the highest ridges in Nodaway county, above One Hundred and Two and Platte rivers, are but little over 200 ft., and the bluffs along the streams are in no place over 50 ft. high. On North Grand river the immediate bluffs measure from 30 to 120 ft. within the upper coal district. Lower down stream, in the middle and lower

coal regions, the hills recede and become lower. Near the base of the upper coal series, it is often 200 to 250 ft. from the valleys to the top of remote ridges. In the lower and middle coal measures are great thicknesses of sandstones and shales, and long gentle slopes are found with bluffs on the streams 25 to 50 ft. high, rising to 100 ft. at a half mile to a mile. When the middle coal measures approach the Missouri river its bluffs vary in height from 100 to 165 ft. Another important characteristic is peculiar, especially near the junction of the upper and middle coal measures, and sometimes to the lower measures. The sandstones are very much denuded, leaving isolated mounds generally 80 to 100 and sometimes 140 ft. high, rising by very long slopes above the lower plains. These mounds are generally capped with limestone, which has preserved them from entire destruction. They are common throughout the lower coal district of S. W. Missouri, with sometimes intervening valleys 10 to 15 m. wide. The mounds have a circular base, sometimes elongated N. and S. This is particularly observable in a range trending S. along the W. line of Bates, Vernon, and Barton counties. From a distance these mounds appear like low mountain ranges. Aside from the mounds, the surface of the country is gently undulating and rolling. The Missouri coal field comprises an area of about 23,100 sq. m., including 160 sq. m. in St. Louis county, 8 in St. Charles, a few outliers in Lincoln and Warren, the remainder in N., W., and S. W. Missouri. In this area are included 8,400 sq. m. of upper or barren measures, 2,000 of exposed middle, and 12,700 of exposed lower measures. The southern and eastern boundary of the lower coal measures is as follows: entering the state about midway the west line of Jasper county, thence extending northeastwardly through Jasper, Barton, Dade, Cedar, St. Clair, Henry, Benton, Pettis, Saline, Howard, Boone, Callaway, Audrain, Montgomery, Ralls, Monroe, Shelby, Knox, Lewis, and Clark counties. The aggregate thickness of the upper coal measures is 1,317 ft., including only about 4 ft. of coal, in which are two seams 1 ft. thick, with lesser streaks. The middle coal measures include a total thickness of about 324 ft., in which are embraced about 8 ft. of coal, including two workable seams of 21 and 24 in., one which varies from 1 ft. to 3 ft., and six seams too thin to work. The lower measures include from 250 to 300 ft., embracing about five workable seams of coal, varying in thickness from $1\frac{1}{2}$ to $4\frac{1}{2}$ ft., and thin seams from 6 to 11 in. thick, with lesser seams and streaks; in all, $13\frac{1}{2}$ ft. of coal. Missouri has therefore nearly 2,000 ft. of coal measures, with a total aggregate of 24 ft. 6 in. of coal. All beds over 18 in. thick are estimated as workable. The estimated area, where such may be reached within 200 ft. from the surface, is about 7,000 sq. m. The drift formation spreads over the whole of N. Missouri,

and is limited in its southern extension by the Missouri river, with the exception of a few outliers just south of the river. In some counties it is over 100 ft. thick, and where it consists chiefly of sand and bowlders the country is hilly and rolling, with occasional chalybeate springs. Where blue clay is more abundant, we find a flat country. Missouri contains valuable lead and iron deposits. (See IRON MOUNTAIN, IRON ORES, and LEAD.) A geological survey of Missouri is now (1875) in progress, under the direction of the state geologist, G. C. Broadhead.—The climate is in some respects extreme. The winters are sometimes long and severe, the summers often hot; and sudden and frequent changes of temperature occur. The mean annual temperature at St. Louis (lat. 38° 37', lon. 90° 16') in 1872 was 55.1°, and the total rainfall 31.5 inches. The prevailing wind was southerly, and the annual mean, as shown by the barometer, was 30.017. The mean temperature for the different months was: January, 28.3°; February, 32.4°; March, 39.1°; April, 57.5°; May, 67.4°; June, 76.9°; July, 79°; August, 74.9°; September, 69.8°; October, 60.5°; November, 40.2°; December, 30.5°. The greatest amount of rainfall, 5.97 inches, was in May.—Maize, wheat, oats, and tobacco form the staple productions. Cotton, hemp, and flax are cultivated to some extent in the southern counties. The peach, nectarine, apple, and pear are cultivated, and the wild grape abounds. Grapes are extensively cultivated in several counties, and large quantities of wine are annually produced. The prairies form excellent pasture lands, and the bottoms furnish canes and rushes for winter fodder. Sheep farming is also successfully and extensively pursued, and swine are very numerous, being readily raised in the forests. Elk are occasionally found in the dense forests of the southeast; deer are still met with even in the partially timbered sections; and many fur-bearing animals in the unsettled parts, but too few to be profitable to the hunter. According to the federal census, there were in the state in 1860 92,792 farms with an average of 215 acres, and in 1870 148,328 with an average of 146 acres. In the former year the land in farms comprised 6,246,871 acres of improved and 13,737,939 of unimproved land, and in 1870 9,130,615 acres of improved and 12,576,605 of unimproved, including 8,965,229 of woodland and 3,611,376 of other unimproved land. In 1870 10,113 farms contained from 3 to 10 acres, 17,431 between 10 and 20, 55,987 between 20 and 50, 38,595 between 50 and 100, 24,898 between 100 and 500, 514 between 500 and 1,000, and 98 over 1,000 acres. The cash value of farms was \$81,716,576; of farming implements and machinery, \$4,456,633; wages paid during the year, including value of board, \$10,326,794; estimated value of all farm productions, including betterments and additions to stock, \$73,137,953; of orchard products, \$71,018; of produce

of market gardens, \$61,735; of forest products, \$39,975; of home manufactures, \$505,298; of animals slaughtered or sold for slaughter, \$4,090,818; of all live stock, \$29,940,238. The productions were 1,093,905 bushels of spring and 13,222,021 of winter wheat, 559,532 of rye, 66,034,075 of Indian corn, 16,578,313 of oats, 269,240 of barley, 36,252 of buckwheat, 43,986 of peas and beans, 4,238,361 of Irish and 241,253 of sweet potatoes, 2,494 of clover, 12,246 of grass, and 10,391 of flax seed, 615,611 tons of hay and 2,816 of hemp, 1,246 bales of cotton, 12,320,483 lbs. of tobacco, 3,649,390 of wool, 14,455,825 of butter, 204,090 of cheese, 19,297 of hops, 16,613 of flax, 116,980 of maple sugar, 1,156,444 of honey, 35,248 of wax, 326,173 gallons of wine, 857,704 of milk sold, 1,730,171 of sorghum and 16,317 of maple molasses. Besides 543,822 horses and 1,269,065 neat cattle not on farms, there were on farms 493,969 horses, 111,502 mules and asses, 398,515 milch cows, 65,825 working oxen, 689,355 other cattle, 1,352,001 sheep, and 2,306,430 swine. Missouri produced in 1870, according to the census, more Indian corn than any other state except Illinois, Iowa, and Ohio, more wine than any other except California, and ranked after Kentucky, Virginia, Tennessee, Ohio, and Maryland in the yield of tobacco; it contained more mules and asses than any other, and more swine than any other except Illinois; next to Texas and Kentucky the highest number of working oxen, and excepting Texas and Illinois the most cattle. The reported production of cereals in 1873 was: corn, 70,846,000 bushels; wheat, 10,927,000; rye, 446,000; oats, 15,670,000; and barley, 266,000.—The great industrial resources of Missouri, its abundant water power, and the enterprise of its citizens have placed it in the front rank of manufacturing states. According to the census, of 1870, it ranked next to New York, Pennsylvania, Massachusetts, and Ohio in the value of products, while besides those states only Connecticut and Illinois surpassed it in the amount of capital invested in manufactures. The general condition of the manufacturing industry in 1870, as compared with that of 1860, is shown in the following statement:

	1860.	1870.
Number of establishments.....	3,157	11,871
Steam engines, number.....	1,688	1,688
“ horse power.....	48,418	48,418
Water wheels, number.....	388	388
“ horse power.....	6,644	6,644
Hands employed, total.....	19,651	65,354
“ males above 16.....	55,304	55,304
“ females above 15.....	8,884	8,884
“ youth.....	5,566	5,566
Capital.....	\$20,024,220	\$80,257,244
Wages.....	\$6,669,916	\$31,055,445
Value of materials.....	\$28,849,941	\$115,593,269
“ of products.....	\$41,732,731	\$206,213,429

Not included in the statement for 1870 is the mining industry, the products of which were valued at \$3,472,513, including bituminous coal worth \$2,011,820; iron ore, \$491,496;

lead, \$201,885; and stone, \$767,312. The number of establishments was 142, employing 3,423 hands and having a capital of \$3,489,250. Missouri in 1870 ranked first in the production of bags other than paper, animal oil, paints, and saddlery and harness, and also in bridge building; second in the manufacture of tobacco, New York being first; and third in the production of bread and crackers, brick, malt liquors, and patent medicines. There were 9,593,591 lbs. of leaf tobacco, valued at \$3,752,374, besides other materials worth \$716,426, used in producing 6,735,362 lbs. of chewing tobacco, valued at \$6,209,593, 3,300,938 lbs. of smoking tobacco, worth \$1,967,918, and 223,900 lbs. of snuff, valued at \$154,000. Besides this, \$817,195 worth of materials were used in the manufacture of 47,157 cigars, valued at \$2,084,093. The relation of the state to the United States in those industries in which Missouri ranked first is shown in the following statement of the value of products:

INDUSTRIES.	Missouri.	United States.
Bags other than paper.....	\$5,087,250	\$8,261,679
Bridge building.....	2,072,620	5,476,175
Oil, animal.....	4,100,000	9,723,667
Paints, not specified.....	2,090,850	5,720,753
Saddlery and harness.....	5,424,685	82,709,951

Pork packing is also a prominent industry of the state. During the season of 1872-'3 a greater number of hogs were packed in Missouri than in any other state except Illinois, while in 1873-'4 it ranked after Illinois and Ohio. The number packed in the former season was 890,679, and in the latter 735,868, of an average gross weight of 259 lbs., the aggregate cost of which was \$8,221,066. The total product of lard in 1873-'4 was 26,153,601 lbs. The great centre of this industry is St. Louis, where 463,793 hogs were packed; Kansas City ranked next, 140,348. The most important industries of the state, as reported by the census of 1870, are shown in the following table:

INDUSTRIES.	No. of establishments.	Steam engines, horse power.	Hands employed.	Capital.	Wages paid.	Value of materials.	Value of products.
Agricultural implements.....	88	325	587	\$791,485	\$408,847	\$699,376	\$1,583,108
Bags other than paper.....	6	35	320	511,000	192,600	1,464,100	5,087,250
Blacksmithing.....	1,850	11	2,651	849,555	554,597	766,814	2,257,211
Boots and shoes.....	1,144	...	2,667	1,065,994	909,807	1,522,718	4,099,552
Bread, crackers, and other bakery products.....	217	118	894	697,615	473,499	2,061,826	8,160,093
Brick.....	186	255	2,198	1,198,451	632,610	446,689	8,148,884
Bridge building.....	7	650	385	1,515,100	268,200	1,540,905	2,072,620
Carpentering and building.....	1,403	86	5,017	1,796,665	2,242,392	7,791,594	15,561,056
Carriages and wagons.....	531	66	2,170	1,594,679	949,609	1,803,557	8,253,794
Cars, freight and passenger.....	5	262	736	660,000	558,700	1,312,000	2,200,150
Clothing, men's.....	507	...	3,470	2,298,025	1,821,959	8,619,435	7,271,562
" women's.....	157	...	884	261,050	209,275	634,850	1,080,170
Confectionery.....	20	33	806	290,250	186,800	602,240	1,274,875
Cooperage.....	291	185	1,536	851,430	670,635	1,107,107	2,234,551
Flouring and grist mill products.....	804	16,471	3,160	8,913,542	1,105,950	24,891,218	31,587,392
Furniture, not specified.....	257	653	1,603	2,295,450	844,101	1,468,708	3,809,024
" chairs.....	13	110	412	814,150	220,500	162,710	612,725
Iron, forged and rolled.....	2	656	401	1,007,143	390,000	626,750	1,455,000
" pigs.....	9	1,925	1,123	1,914,000	856,780	1,875,708	2,391,618
" castings not specified.....	23	477	397	321,000	253,210	766,162	1,182,235
" stoves, heaters, and hollow ware.....	13	635	1,590	2,757,500	1,156,674	1,491,775	2,981,850
Liquors, distilled.....	16	164	110	413,400	56,115	535,756	917,450
" malt.....	87	1,177	783	4,681,050	597,972	2,377,028	6,519,545
" vinous.....	190	...	438	680,875	79,125	683,811	984,442
Lumber, planed.....	23	611	220	813,100	99,071	595,509	557,840
" sawed.....	806	14,697	3,900	3,241,670	1,081,513	3,425,235	6,338,112
Machinery, steam engines, and boilers.....	32	693	1,421	2,079,900	1,100,100	1,506,064	3,825,100
Masonry, brick and stone.....	305	...	1,248	227,805	562,328	997,073	1,882,135
Meat packed, pork.....	23	397	952	4,042,000	412,965	10,361,959	18,621,925
Molasses and sugar, refined.....	1	320	302	2,000,000	175,000	3,667,000	4,185,250
Oil, animal.....	3	82	77	525,000	62,500	2,806,100	4,100,000
Paints, not specified.....	10	445	235	987,500	162,830	1,550,516	2,090,850
Patent medicines and compounds.....	25	55	312	1,049,800	207,140	771,003	2,078,775
Printing and publishing, not specified.....	23	167	1,183	1,797,500	990,050	1,819,270	8,837,250
" newspaper.....	52	76	534	864,700	304,185	870,559	994,577
" job.....	25	29	218	212,100	125,900	206,675	426,800
Saddlery and harness.....	390	...	1,842	2,025,164	892,518	3,189,739	5,424,685
Sash, doors, and blinds.....	25	824	601	1,155,000	456,283	1,800,660	2,663,416
Soap and candles.....	13	359	274	1,075,400	139,550	1,288,328	1,794,160
Tin, copper, and sheet-iron ware.....	353	...	1,356	1,240,405	623,195	1,309,206	2,945,460
Tobacco, chewing, snuffing, and smoking.....	65	244	1,971	2,444,700	874,560	4,480,808	8,856,511
" cigars.....	313	...	1,417	586,860	611,867	805,687	2,059,038

—The commerce of Missouri is very extensive, since a large portion of the produce of the northwest, as well as of the supplies for that section, is borne over the Missouri and Mississippi rivers and the numerous railroads of the state. The great commercial centre of all this trade is St. Louis, between which and other leading ports on the western and southern riv-

ers numerous boats are constantly plying. In addition to its vast domestic trade, it has an important foreign commerce under the act of congress of 1870 allowing foreign merchandise to be transported in bond direct to interior ports. The value of this import trade during the year ending June 30, 1873, was \$1,167,690. St. Louis, St. Joseph, and Kansas

City are United States ports of delivery, belonging to the district of Louisiana. In 1873, 314 vessels, of 131,087 tons, were registered, enrolled, and licensed at St. Louis, and 9, of 1,447 tons, at St. Joseph; 185, of 81,842 tons, were steamers. At St. Louis 24 vessels, of 7,756 tons, were built in 1873.—Missouri had 33 m. of railroad in 1853, and 817 in 1860. The increase of mileage was small up to 1866, when the whole number of miles was 925. In 1870 there were 2,000 m.; in 1871, 2,580; in 1872, 2,673; in 1873, 2,858; and in 1874, 2,985 m. of main track and branches. The total capital stock in 1873 was stated at \$74,440,242,

and the average cost of the railroads per mile at \$60,953. The total receipts amounted to \$12,188,908, of which about 68 per cent. was from freight and 32 per cent. from passengers. The operating expenses were \$7,864,214, and the net earnings \$4,322,694; dividends paid, \$250,000. The railroads were valued for taxation at \$24,231,330. The aid granted by the state for building them amounts to \$16,762,904, and by counties and cities to \$28,576,000, making a total of \$45,338,904. The railroads in operation in 1874, with their termini and lengths, are indicated in the following statement:

CORPORATIONS.	TERMINI.	Miles completed in the state in 1874.	Total length between termini when different from preceding.
Atlantic and Pacific.....	Pacific to Vinita, Ind. ter.....	298	328
Burlington and Southwestern.....	Burlington, Ia., to St. Joseph.....	10	260
Branches in progress.....	Unionville to Kansas City.....	20	156
Cape Girardeau and State Line.....	Lexington to Neosho.....	5	185
*Chicago and Southwestern.....	Cape Girardeau to state line, Ark.....	5	85
Hannibal and St. Joseph.....	Washington, Ia., to Leavenworth, Kan.....	143	271
Branches.....	Junction to Atchison, Kan.....	30	...
Kansas City, St. Joseph, and Council Bluffs.....	Hannibal to St. Joseph.....	206	...
Branch.....	Palmyra to Quincy, Ill.....	15	...
Keokuk and Kansas City.....	Cameron to Kansas City.....	53	...
†Lexington and St. Louis.....	St. Joseph to Atchison, Kan.....	22	...
‡Louisiana and Missouri River.....	Kansas City to Council Bluffs, Ia.....	149	200
Branch.....	St. Joseph to Hopkins.....	60	...
Memphis, Carthage, and Northwestern.....	Keokuk, Ia., to Kansas City.....	15	235
Mississippi Valley and Western.....	Sedalia to Lexington.....	55	...
Missouri, Iowa, and Nebraska.....	Louisiana to Mexico.....	50	...
Missouri, Kansas, and Texas.....	Mexico to Cedar City.....	50	...
Osage division.....	Pierce City to Independence, Kan.....	46	111
†Osage Valley and Southern Kansas.....	Keokuk, Ia., to St. Louis.....	40	158
*Pacific of Missouri.....	Alexandria to Nebraska City, Neb.....	74	300
Branch.....	Hannibal to Denison, Texas.....	250	576
Quincy, Missouri, and Pacific.....	Holden to Paola, Kan.....	85	54
St. Louis, Iron Mountain, and Southern.....	Booneville to Tipton.....	25	...
Branches.....	St. Louis to Kansas City.....	254	...
Cairo, Arkansas, and Texas division.....	Carondelet to Kirkwood.....	15	...
St. Louis, Kansas City, and Northern.....	Quincy, Ill., to Brownsville, Neb.....	70	230
Branch.....	St. Louis to Columbus, Ky.....	196	...
Leased. { (Boone County and Jefferson City).....	Mineral Point to Potosi.....	4	...
(Chillicothe and Brunswick).....	Bismark to Arkansas state line.....	110	...
(St. Louis, Council Bluffs, and Omaha).....	Cairo, Ill., to Poplar Bluff.....	70	...
†St. Joseph and St. Louis.....	St. Louis to Junction (H. and St. J. railr'd).....	265	...
†St. Louis, Lawrence, and Denver.....	Moberly to Iowa state line.....	88	...
St. Louis, Salem, and Little Rock.....	Centralia to Columbia.....	22	...
	Brunswick to Chillicothe.....	36	...
	Chillicothe to Pattonsburg.....	41	...
	North Lexington to St. Joseph.....	76	...
	Pleasant Hill to Lawrence, Kan.....	22	61
	Cuba to Salem.....	40	...
Total.....		2,955	

—The number of national banks in operation Nov. 1, 1873, was 35, having a paid-in capital of \$9,135,300 and an outstanding circulation of \$5,908,379; circulation per capita, \$3 43; ratio of circulation to wealth, 0·4 per cent.; to bank capital, 64·3 per cent. There were in St. Louis 7 banks with a circulation of \$1,763,150.—The constitution grants the elective franchise to every male citizen of the United States, and to every foreigner who has declared his intention to become a citizen, who has attained the age of 21 years, and resided in the state one year next preceding his registration as a voter, and during the last

60 days of that period in the place of voting. After Jan. 1, 1876, every person who was not a qualified voter prior to that time must also be able to read and write as a qualification for voting. The general elections are held biennially (even years) on the Tuesday next after the first Monday in November. The legislature is limited by the constitution to 34 senators, elected for four years (one half every two years), and 200 representatives, chosen for two years. The present number (1875) is 34 senators and 131 representatives. New apportionments are to be made immediately after every national census, and also after every state census, which the constitution provides for being taken in 1876 and every ten years thereafter. The sessions of the legislature are biennial, be-

* Leased to Chicago, Rock Island, and Pacific.
† Leased to Atlantic and Pacific.
‡ Leased to Chicago and Alton.

ginning on the first Wednesday of January in odd years. Members of the legislature must be white males, and must have paid a state and county tax. The governor is elected for two years, and is not eligible to that office for more than four years in six. His salary is \$5,000 per annum. A majority of each house of the legislature is sufficient to pass a bill over the executive veto. The other state officers, who are elected for the same term as the governor, are a lieutenant governor (who receives \$7 a day during the session of the general assembly), secretary of state, auditor, treasurer (each of whom receives \$3,000 a year), and attorney general. The constitution declares colored citizens ineligible to the above named state offices and also as members of the legislature. The supreme court, consisting of five judges elected by the people for six years, holds two annual sessions at St. Louis, at Jefferson City, and at St. Joseph. Besides having appellate jurisdiction, it issues remedial writs. There are 29 circuit courts, each having one judge elected for six years, except that for St. Louis, which has five judges. They generally hold two sessions a year. Besides these there are county courts of three justices in each county, and justices of the peace. Imprisonment for debt is prohibited by the constitution except for fines and penalties imposed for violation of law. Amendments to the constitution must be approved by a majority of the members elected to each house, and ratified by a vote of the people at the next general election. A homestead not exceeding \$3,000 in value in cities of 40,000 inhabitants or more, and not exceeding \$1,500 in smaller cities and in the country, is exempt from levy on execution. The real estate of a married woman is not liable for the debts of the husband. The grounds of divorce are impotence, desertion for a year, adultery, conviction of felony or infamous crime, habitual drunkenness for a year, cruelties or indignities that render life intolerable, the husband becoming a vagrant, and pregnancy by another than the husband without his knowledge at the time of the marriage. Missouri is represented in congress by two senators and 13 representatives, and has therefore 15 votes in the electoral college. The bonded debt of the state on Jan. 1, 1875, and the purposes for which the bonds were issued, were as follows:

Hannibal and St. Joseph railroad.....	\$3,000,000
Missouri Pacific railroad.....	3,735,000
St. Louis and Iron Mountain railroad.....	2,340,000
S. W. Branch Pacific railroad.....	1,455,000
North Missouri.....	2,853,000
Platte County.....	504,000
Cairo and Fulton.....	392,000
Consols.....	2,727,000
State debt proper.....	439,000
Northwestern lunatic asylum.....	200,000
University.....	201,000
S. W. branch Pacific railroad (guaranteed).....	1,589,000
Refunding state bank stock.....	104,000
Funding state bonds.....	400,000
Certificate to school fund.....	900,000
Total.....	\$20,839,000

The total receipts into the treasury during the

year ending Jan. 1, 1875, were \$3,307,419, while the disbursements on warrants amounted to \$3,434,782. The balance in the treasury was \$566,215. The constitution provides that an annual tax of 15 per cent. shall be levied upon the gross receipts of the Pacific, North Missouri, and St. Louis and Iron Mountain railroads for the payment of the principal and interest of the state bonds received by those companies; also a tax of one quarter of one per cent. on all real and personal taxable property for the payment of the state debt. According to the federal census of 1870, the assessed value of real estate was \$418,527,535; personal, \$137,602,434. The total taxable wealth in 1874 (two counties not reported) was \$589,174,215, on which there was levied a revenue tax ($\frac{1}{4}$ of 1 per cent.) of \$1,178,496, interest tax ($\frac{1}{4}$ of 1 per cent.) of \$1,473,183, and county tax amounting to \$5,179,241.—The state asylum for the insane is in Fulton, and was opened in 1851. Of the total number (668) treated during the two years ending Dec. 1, 1874, 136 were discharged recovered, 47 improved, 65 stationary, and 82 died. In 1875 there were 338 in the asylum. The insane asylum in St. Louis is a county institution, but the state appropriated \$30,000 toward its support during 1873 and 1874. An additional asylum for the insane was established at St. Joseph in 1874. Deaf and dumb persons between the ages of 7 and 30 years are received free of charge for board and tuition at the state asylum in Fulton. This was opened in 1851, and at the beginning of 1873 had 146 pupils and 8 instructors. The annual appropriation by the state for current expenses is \$7,000, besides \$2,500 to the indigent fund. St. Bridget's institute (Roman Catholic) in St. Louis, for the education of the deaf and dumb, was founded in 1860. The institution for the blind in St. Louis, opened in 1851, receives from the state an annual appropriation of \$15,000, besides the salaries of officers and teachers, amounting to about \$6,000. There were 100 pupils in attendance in 1874. The state penitentiary at Jefferson City has a capacity for 1,200 convicts; the number in confinement in 1874 was 1,000, including 42 females. Punishment is by the dungeon, and in some cases the lash. The prisoners are employed in the manufacture of shoes, furniture, saddletrees, and barrels, and in the foundry and machine shop; about 500 convicts were thus employed in 1874. The penitentiary is leased to a company, and is just becoming self-sustaining.—The constitution requires the general assembly to maintain free schools open to all persons between the ages of 5 and 21 years. Separate schools may be established for colored children, but all funds provided for the support of public schools must be appropriated in proportion to the number of children without regard to color. Certain lands and other sources of income are set apart for a permanent school fund, and in case the income of such fund be insufficient to sustain a free school

at least four months in every year in each school district, the general assembly may raise the necessary amount by a local tax. The permanent school fund on Jan. 1, 1875, amounted to \$2,624,354, the income of which, with 25 per cent. of the state revenue, is distributed annually according to the number of pupils enumerated. The amount thus distributed March 31, 1874, was \$410,269. The legal school age is from 5 to 21. The general assembly is empowered to provide for compulsory education. The supervision of public instruction is vested by the constitution in a board of education, consisting of a superintendent of public schools, elected by the people for four years, and the secretary of state and attorney general. A state university, "with departments for instruction in teaching, in agriculture, and in natural science," is made a part of the free public school system of the state. Appropriations of any public fund for sectarian education by the state, county, or any municipal corporation, are prohibited by the constitution. The most important statistics of the public schools of the state for 1873 are thus reported by the state superintendent:

Number of persons between 5 and 21 years of age.	705,817
White males.....	343,540
" females.....	824,084
Colored males.....	20,591
" females.....	17,652
Number between the ages of 5 and 16 years.....	435,249
Number of public schools.....	7,829
For white persons.....	7,547
For colored persons.....	282
Number of school districts.....	7,438
" of school houses.....	7,224
" of private schools.....	661
" of normal schools.....	5
Number enrolled in public schools.....	371,440
" in private schools.....	33,525
" in university and normal schools.....	1,252
Daily average attendance in public schools.....	210,692
Number of teachers (male 6,251, female 3,935).....	9,076
Average monthly wages, male.....	\$39 57
" female.....	\$30 36
Total income for school purposes.....	\$2,117,662
From state fund, including 25 per cent. state revenue.....	\$252,461
From county fund.....	\$181,546
From township fund.....	\$137,222
From taxation.....	\$1,496,433
Total expenditures.....	\$1,638,353
Teachers' wages.....	\$1,125,605
Buildings and grounds.....	\$295,026
Rent of rooms and repairs.....	\$54,518
Fuel and contingencies.....	\$67,357
Furniture and apparatus.....	\$65,322
Balance of moneys unaccounted for.....	\$179,309
Total valuation of school property.....	\$6,774,506
Cost of education per scholar, based on enumeration.....	\$3 00
Cost of education per scholar, based on attendance or enrollment.....	\$5 70

There are six normal schools, supported at public expense and without charge for tuition, with an aggregate capacity for upward of 2,300 pupils, viz.: the normal college connected with the state university, with accommodations for 150 students; the city normal school in St. Louis, 150; the North Missouri school, at Kirksville, 700; the South Missouri, at Warrensburg, 600; the Southeast Missouri, at Cape Girardeau, 500; and the normal department of Lincoln institute, at Jefferson City, 200. The

condition of these institutions in 1873-'4 is shown in the following statement:

INSTITUTIONS.	Organ- ized.	Annual state appro- priation.	No. of in- structors.	No. of pupils.
Normal department state university.....	1868	.....	13	88
North Missouri nor- mal school.....	1871	\$10,000	9	663
South Missouri nor- mal school.....	1871	10,000	11	898
Southeast Missouri normal school.....	1873	5,000	5	113
St. Louis normal school.....	1857	.....	11	123
Normal department Lincoln institute....	1866	5,000	6	40

The normal schools are established upon a broad and liberal basis. The North Missouri and South Missouri schools have been erected at a cost of about \$150,000 and \$200,000 respectively. The complete course embraces four years. The normal department of Lincoln institute is for the training of colored teachers, while that in St. Louis is a city institution, though open to applicants from all parts of the state. The law requires two teachers' institutes to be held in each county every year.—The state university, organized in 1840, is at Columbia, near the centre of the state. It has received Missouri's portion of the national grant of land made by congress in 1862 for the establishment of colleges of agriculture and the mechanic arts. Its government is vested in a board of 24 curators, who are appointed by the governor with the consent of the senate, and who appoint the president and instructors. There is also a board of five visitors, who are required to examine into the condition of the university at least once a year. The plan of the institution embraces the college proper; the normal school, opened in 1868; agricultural and mechanical college, 1870; school of mines and metallurgy at Rolla, 1871; college of law, 1872; medical college, 1873; and department of analytical and applied chemistry, 1873. It is expected that other departments relating to the mechanic arts, the fine arts, engineering, and architecture and construction will be organized. The total number of students in attendance during the year 1873-'4 was 553, including 5 resident graduates, 176 in the college proper, 216 in the preparatory department, 107 in the school of mines, 34 in the law, and 15 in the medical school. The whole number of instructors was 29. The university is open to women on the same terms as to men. The scientific department of Washington university in St. Louis was opened in 1857, and the college in 1859. It now embraces: 1, the academy, a preparatory department; 2, Mary institute, a seminary for girls; 3, the college; 4, the polytechnic department; 5, the law school. In 1873-'4 the number of instructors in all departments was 22, and of pupils 908. The colleges and professional schools of the state are represented in the following statement for 1873-'4:

NAME OF INSTITUTION.	Where situated.	Denomination.	Date of organization.	No. of teachers.	No. of pupils, preparatory.	No. of pupils, collegiate.
Central college.....	Fayette.....	M. E. church, South..	1871	6	30	100
Christian university.....	Canton.....	Christian.....	1856	8	..	160
College of the Christian Brothers.....	St. Louis.....	Roman Catholic.....	1859	..	..	..
Drury college.....	Springfield.....	Congregational.....	1873	8	92	28
Hannibal college.....	Hannibal.....	M. E. church, South..	1868	5	90	145
Lewis college.....	Glasgow.....	Methodist Episcopal..	1865	4	..	65
Lincoln college.....	Greenwood.....	United Presbyterian..	1870	4	42	..
McGee college.....	College Mound.....	Cumb. Presbyterian..	1853	10	..	184*
St. Joseph college.....	St. Joseph.....	Roman Catholic.....	1867	9	100	92
St. Louis university.....	St. Louis.....	Roman Catholic.....	1832	23	..	374†
St. Paul's college.....	Palmyra.....	Protestant Episcopal..	1844	5	83	..
St. Vincent's college.....	Cape Girardeau.....	Roman Catholic.....	1844	16	113	..
Washington university.....	St. Louis.....	..	1857	22	883	34
Westminster college.....	Fulton.....	Presbyterian.....	1852	5	..	75
William Jewell college.....	Liberty.....	Baptist.....	1853	9	..	127
Woodland college.....	Independence.....	Christian.....	1869	4	80	..
THEOLOGICAL SCHOOLS.						
German Evangelical Lutheran college, Concordia.....	St. Louis.....	Evangelical Lutheran..	1839	6	..	161
St. Vincent's.....	Cape Girardeau.....	Roman Catholic.....	1844	16	..	19
Theological school of Westminster college.....	Fulton.....	Presbyterian.....	..	..	..	..
Vandeman school of theology.....	Liberty.....	Baptist.....	1869	5	..	49
LAW SCHOOLS.						
Law college of state university.....	Columbia.....	..	1872	7	..	84
Law department of Washington university.....	St. Louis.....	..	1867	10	..	40
MEDICAL SCHOOLS.						
Kansas City college of physicians and surgeons.....	Kansas City.....	..	1869	10	..	15
Medical college of state university.....	Columbia.....	..	1873	5	..	15
Missouri medical college.....	St. Louis.....	..	1840	18	..	61
St. Louis medical college.....	".....	..	1841	10	..	164
Homeopathic medical college of Missouri.....	".....	..	1856	13	..	39
Missouri dental college.....	".....	..	1865	13	..	8
St. Louis college of pharmacy.....	".....	..	1864	3	..	42
SCIENTIFIC SCHOOLS.						
Agricultural and mechanical college (state university).....	Columbia.....	..	1870	10	..	183
Missouri school of mines and metallurgy (state university).....	Rolla.....	..	1871	6	..	107
Polytechnic department of Washington university.....	St. Louis.....	..	1857	16	..	39

The leading institutions for the advanced instruction of women are the Ursuline academy, Mary institute, and academy of the Visitation, in St. Louis; Christian college and Stephen's female college, Columbia; Howard female college, Fayette; Independence female college, Independence; St. Teresa's academy, Kansas City; Liberty female college, Liberty; Ingleside female college, Palmyra; and Lindenwood college for young ladies, St. Charles. The oldest of these are the academy of the Visitation, organized in 1833, and Ursuline academy, opened in 1848, both Roman Catholic. Nine of these institutions report an aggregate of 1,136 pupils, of whom 807 were in the collegiate and 329 in preparatory studies, and 97 instructors, including 11 males. St. Louis has four commercial and business colleges, and there is one in St. Joseph and one in Kansas City.—According to the census of 1870, the total number of educational institutions in Missouri was 6,750, having 9,028 teachers, of whom 3,871 were females, and 370,337 pupils. The total income of the whole was \$4,340,805, of which \$57,567 was from endowment, \$3,067,449 from taxation and public funds, and \$1,215,789 from tuition and other sources. Besides the 5,996 public schools, having 7,362 teachers, there were 37 colleges with 261

teachers and 6,067 students, 45 academies with 333 teachers and 5,031 pupils, and 586 private schools with 770 teachers and 26,816 pupils. The total number of libraries in the state was 5,645, having 1,065,638 volumes; 3,903 with 566,642 volumes were private, and 1,742 with 498,996 volumes other than private. Of the latter there was 1 state library, with 12,000 volumes; 11 town, city, &c., 8,097; 125 court and law, 35,104; 50 school, college, &c., 44,825; 1,283 Sabbath school, 188,493; 243 church, 96,845; and 28 circulating, 112,450. The largest libraries in the state are the St. Louis mercantile, 45,000 volumes; St. Louis university, 25,000; public school library of St. Louis, 36,000; and college of the Christian Brothers, 10,000. The total number of newspapers and periodicals was 279, having an aggregate circulation of 522,866, and issuing annually 47,980,422 copies. There were 21 daily, with a circulation of 86,655; 5 tri-weekly, 13,800; 22 weekly, 342,361; 3 semi-monthly, 22,000; 23 monthly, 53,650; and 1 annual, 1,500. In 1874 there were reported 24 daily, 5 tri-weekly, 1 semi-weekly, 284 weekly, 6 semi-monthly, 30 monthly, 1 bi-monthly, and 1 quarterly; total, 352.—In 1870 the state contained 3,229 religious organizations, having 2,082 edifices with 691,520 sittings, and property valued at \$9,709,358. The different denominations were represented as follows:

* In all departments.

† In collegiate commercial courses.

DENOMINATIONS.	Organizations.	Edifices.	Sittings.	Property.
Baptist, regular.....	792	513	144,210	\$1,090,705
" other.....	18	5	1,150	5,000
Christian.....	394	229	68,545	514,700
Congregational.....	87	27	12,295	295,700
Episcopal, Protestant.....	83	51	20,950	48,650
Evangelical Association.....	5	5	1,300	15,000
Friends.....	2	2	500	2,000
Jewish.....	4	4	2,100	217,100
Lutheran.....	94	86	39,550	768,600
Methodist.....	1,066	626	185,420	1,645,300
New Jerusalem (Swedenborgian).....	4	3	1,000	22,500
Presbyterian, regular.....	332	232	74,500	1,210,750
" other.....	144	87	28,850	175,000
Reformed church in the United States (late German Reformed).....	11	9	1,300	16,900
Roman Catholic.....	154	166	97,550	8,119,450
Unitarian.....	10	9	3,200	148,200
United Breth'n in Christ.....	33	20	3,500	32,000
Universalist.....	6	2	900	2,500
Unknown (Union).....	5	6	1,300	8,300

—By the grant of Louis XIV. to Crozat dated Sept. 14, 1712, "all the country drained by the waters emptying directly or indirectly into the Mississippi is included in the boundaries of Louisiana." (See LOUISIANA.) The states of Arkansas, Iowa, Kansas, and Nebraska were parts of the same grand division. The northern portion was called Upper Louisiana. The settlement and progress of Missouri were later and less rapid than those of the lower districts; but as early as 1720 its lead mines had attracted attention. In 1755 Ste. Genevieve, its oldest town, was founded. In 1762 France ceded to Spain the territory W. of the Mississippi, and the portion E. of that river to England. France had been despoiled of all her North American possessions. During the contest numbers of Canadian French settled in both Upper and Lower Louisiana, and a flourishing river trade sprang up between the two sections. Lands were granted liberally to the colonists, and numerous emigrants from Spain flocked into the country. In 1775 St. Louis, originally a depot for the fur trade, contained 800 inhabitants, and Ste. Genevieve about 460. At this time Spain, siding with the colonists, entered into hostilities against England. In Lower Louisiana and Florida the arms of Spain were successful; but in 1780 St. Louis was attacked by a body of English and Indians from Michilimackinac, and was only relieved by the timely arrival of Gen. Clarke from Kaskaskia. The general peace of 1783 put an end to hostilities. In the division of the Louisiana purchase in 1803, Missouri was included in the district of Louisiana, which in 1805 was erected into the territory of Louisiana, with St. Louis as the seat of its government. In 1812, on the admission of the present state of Louisiana into the Union, the name of the territory was changed to Missouri, and its government was made representative. The limits on the west were gradually extended by treaties with the Indians. In 1810 the population numbered 20,845, of whom all but about 1,500 belonging to Arkansas were settled within the

present limits of Missouri. Immigration now came in rapidly from the east. In 1817 the total population had increased to 60,000, and St. Louis contained 5,000 inhabitants. In this year the assembly applied to congress for permission to frame a state constitution. The struggle to prevent the extension of slavery into the new states led to the celebrated compromise of 1820, whereby it was determined that Missouri should come into the Union as a slaveholding state, but that slavery should never be established in any states formed in the future from the lands lying N. of lat. 36° 30'. The state constitution was framed by a convention of 40 delegates convened in St. Louis, July 19, 1820; and the state was admitted by proclamation of the president, Aug. 10, 1821. From this time until the present the progress of the state in material prosperity has been rapid; immigration has been constant, and agriculture, mining, commerce, and manufactures have been expanded into vast interests. The first movement in Missouri toward secession was made on Jan. 16, 1861, when a bill was passed by the senate providing for the assembling of a state convention. This body was organized at Jefferson City on Feb. 28, and reassembled in St. Louis March 4. Popular feeling was opposed to secession, and the action of the convention, which adjourned without passing any measures of great importance, as well as of the legislature, was strongly in favor of the Union. Soon afterward United States troops began to assemble under command of Gen. Harney in St. Louis, which was regarded as an important military point for operations against the insurgent states. Some minor conflicts having arisen between the federal troops and the state militia, and negotiations for the maintenance of peace having failed, a proclamation was issued on June 12 by Gov. Jackson, calling into active service 50,000 of the state militia "for the purpose of repelling invasion, and for the protection of the lives, liberty, and property of the citizens." On the following day 1,500 United States troops under command of Gen. Lyon were moved from St. Louis to Jefferson City, where they arrived on the 15th. About the same time other troops were sent to Rolla. Gov. Jackson, however, with other officers of the state government, had fled from Jefferson City on the 13th and gone to Booneville, where he summoned the state troops to his support. Gen. Lyon immediately advanced upon this point, and on June 17 defeated the state troops, who subsequently retreated to Syracuse. The greater portion of the state at this time was under federal control, but hostile state troops were organized in the southwest under Gen. Price. The state convention, having been reassembled, on July 30 declared vacant the offices of governor, lieutenant governor, and secretary of state, and filled them by appointment. The seats of the members of the legis-

lature were also declared vacant. On Aug. 1 Gov. Gamble, appointed by the convention, was inaugurated. On the 5th Gov. Jackson, at New Madrid, issued a proclamation declaring the separation of the state from the Union. Confederate forces were now assembling in large numbers in S. W. Missouri under Gens. Pillow, Hardee, McCulloch, Price, and Thompson. From Booneville Gen. Lyon's force moved to Springfield, and on Aug. 10 encountered a force of state troops and confederate soldiers from Arkansas under Gens. Price and McCulloch at Wilson's creek, near Springfield, where Gen. Lyon was killed. After the battle, the federal forces, under command of Col. Sigel, retired to Rolla. On Aug. 31 Gen. Fremont, commanding the department of the West, declared martial law throughout the state. A large federal force was now gathered at St. Louis for operation against the confederates in the S. W. part of the state. On Sept. 20 Lexington, defended by about 3,000 federal soldiers under Col. Mulligan, was surrendered after a severe conflict with a much larger army under Gen. Price. This caused Gen. Fremont, Sept. 27, to hasten from St. Louis to Jefferson City. The confederates, however, numbering about 20,000, soon retired from Lexington to Springfield and further south. The advance of Fremont in the southwest, which was attended with numerous skirmishes, was made in five divisions under Gens. Hunter, Pope, Sigel, Asbóth, and McKinsty. On Nov. 2 Fremont was succeeded by Gen. Hunter. The federal forces soon after began to recede, and the confederates to advance in the same direction. On Nov. 18 Gen. Halleck arrived at St. Louis to assume command of the western department. Certain members of the legislature, friendly to the confederate cause, having obtained a quorum of that body at Neosho, on Nov. 2 passed an act ratifying an arrangement between commissioners of the state and the confederate government, by which Missouri was to become a member of the confederacy. At the beginning of 1862 nearly half of the state was held by the confederate troops; but in February a strong federal force under Gen. Curtis drove Price into Arkansas. Throughout the year the state was much disturbed by guerilla warfare. In the summer of 1863 the state convention which had been originally assembled to consider the subject of secession, and had been kept in existence by adjournments, passed an ordinance providing for the emancipation of all slaves in the state in 1870. In the autumn of 1864 Gen. Price, having again invaded Missouri, threatened St. Louis, and traversed a large part of the state, but was finally forced to retreat into Arkansas. The first election for state officers after the beginning of the war was held in November, 1864, the state having been governed during this period by officers appointed by the state convention. On Jan. 6, 1865, a convention as-

sembled in St. Louis and framed a new constitution, which was ratified by the people in June following by a vote of 43,670 to 41,808. During the war Missouri furnished to the federal army 108,773 troops, equivalent to 86,192 for three years. The 15th amendment to the federal constitution was ratified by the legislature in 1869 by a large majority.

MISSOURI RIVER (*i. e.*, Mud river), the principal tributary of the Mississippi. It properly forms one stream with that river, being much greater in length and volume than the other branch which bears that name above the mouth of the Missouri. It rises near the boundary between Montana and Idaho, among the Rocky mountains, in several small streams, the principal of which are Jefferson and Wisdom rivers (the latter rising within a mile of the head springs of Clarke's fork of the Columbia), whose sources lie between lat. 44° 20' and 45° 35' N., and lon. 112° and 114° W., uniting about lat. 45° 15', lon. 110° 30'. According to some geographers, the Missouri properly begins about 80 m. further E., where the stream formed by the Jefferson and Wisdom, which on this hypothesis retains thus far the former name, is joined by the Madison and Gallatin. The Madison, the middle and largest fork, by some considered the true source, rises in the National Park in N. W. Wyoming, near the sources of the Snake and Yellowstone. After a devious course N. from the junction of the three forks to about lat. 48°, the Missouri runs E. through Montana into Dakota, where it is joined by (lessor) White Earth river. Its general direction is S. E. thence to the Mississippi, which it joins in lat. 38° 50' 50" N., lon. 90° 14' 45" W., after separating Nebraska from Iowa, forming a small part of the dividing line between Missouri and Kansas and Nebraska, and flowing across the whole state of Missouri. Its length to the Madison fork source is 2,908 m., which added to 1,286 m., the length of the lower Mississippi, makes its whole course to the gulf 4,194 m. It has commonly been navigated as far as the mouth of the Yellowstone, on the border of Dakota and Montana, but it may be ascended by steamboats much further, to the Great falls almost at the very base of the mountains, and about 2,500 m. from the Mississippi. There is no serious obstruction to navigation below this point, though at certain seasons the water is shallow, owing to its passing through a dry and open country in its upper course, and being subject to extensive evaporation. It is generally turbid and rapid. In its lower course it is bordered by a narrow alluvial valley of great fertility, back of which lie generally extensive prairies. At its mouth it is over half a mile wide, and in many places it is much wider. Its principal tributaries are the Yellowstone, Little Missouri, Big Cheyenne, (greater) White Earth, Niobrara, Platte or Nebraska, Kansas, and Osage on the right, and the Milk, Dakota, Big Sioux, Little Sioux, and Grand on the left. It will thus be seen that

the Missouri receives all the great rivers which rise on the eastern declivity of the Rocky mountains, with the single exception of the Arkansas, and a large share of the waters which lie between its own bed and that of the Upper Mississippi. The area which it drains is estimated at 518,000 sq. m. The most important places on its banks are Fort Benton in Montana, Yankton in Dakota, Sioux City and Council Bluffs in Iowa, Omaha in Nebraska, Atchison and Leavenworth in Kansas, and St. Joseph, Kansas City, Lexington, Booneville, Jefferson City, and St. Charles in Missouri. About 400 m. from its source the river passes through a narrow gorge denominated the "Gates of the Rocky mountains." It is 5½ m. long, and the perpendicular walls of rock, which rise directly from the water to the height of 1,200 ft., are only 450 ft. apart. For the first 3 m. there is but one spot where a foothold could be obtained between the water and the rock. The Great falls are 145 m. below this point. They are among the grandest on the continent, and consist of four cataracts, respectively of 26, 47, 19, and 87 ft. perpendicular descent, separated by rapids. The whole fall in 16½ m. is 357 ft.

MISSOURIS, or Missourias, a tribe of Indians belonging to the Dakota family, and calling themselves Nudarcha, Missouri being the name given them by the Illinois. Marquette in 1673 first heard of them as the first tribe up the river which bears their name. As allies of the Illinois they soon established friendly relations with the French, and were among the tribes who in 1712 marched to the relief of Detroit. In 1719 they entrapped and cut to pieces a Spanish expedition sent against them from Mexico. In 1720 the French under De Bourgmont established a fort on an island near the Missouris, and the great chief aided him to reach and make peace with the Comanches. He took some of the chiefs to France in 1725, and Dubois, a sergeant who had married a girl of the tribe, returned with them as commander of the post; but the French were soon after massacred to a man. Friendly relations were afterward restored, and Missouris served in the French operations against the Chickasaws. They were opposed to the English ascendancy. Lewis and Clarke found them in 1805 reduced to a band of 300 souls, with 80 warriors, on the south side of the Platte, at war with the Omahas, Poncas, Osages, Sioux, and Kansas. Great numbers had been carried off by smallpox, and, abandoning their ancient village in a fertile plain on the Missouri below the Grand, they had sought refuge with the Otoes, with whom they have ever since been connected. After various sales of lands by them to the government, the combined tribes were removed to the Big Blue. In 1862 they numbered 708, and in 1872 had decreased to 464. They now receive \$9,000 a year, but when ten payments have been made the annuity is to be reduced to \$5,000. Missions at-

tempted by the Presbyterians, as well as all attempts at education, have proved unavailing.

MISTAKE. It is a fundamental principle of law that no man shall avail himself, either to establish or resist a claim, of his mistake or ignorance of law. So also in criminal law it is an ancient maxim: *Ignorantia legis neminem excusat*. The reason sometimes assigned, that the law supposes every one to be acquainted with it, is nothing more than a repetition of the rule in other words. The true reason is, the extreme danger of permitting any person to shelter himself under his ignorance of the law, or to found a right upon it. For this would be, in the words of the king's bench in England, "to hold out a premium for ignorance," and ignorance of that which it is of the utmost importance that all men should know. Hence the law distinguishes most carefully between a mistake of law and a mistake of fact; for the latter, as a general rule, is rectified, and all mischievous consequences prevented, as far as possible; and a mistake as to the law of a foreign state or country is regarded only as a mistake of fact, because no one is under any obligation to become acquainted with a foreign law.—To this general rule there are some important qualifications; the principal one being, that no mere acknowledgment, or waiver of defence or right, made under a mistake of law, is binding. Thus, if one has a good legal defence against a promissory note, but, through ignorance or mistake of the law, supposes himself bound to pay it, and on this supposition gives a promise to pay it, the promise will not, in general, be binding upon him. In many cases also much relief is to be obtained by the construction of a contract; but this is always governed and limited by certain definite rules. It is often said by ethical writers, that a party to a contract is bound to execute the contract in the sense which he knew the other party to put upon it. This may be true always in a moral sense; but it certainly is not true in a legal sense, although courts have sometimes seemed to think it was a good rule of law. The true rule and the reason of it are easily seen. If A contracts with B in writing to sell him 100 mules, and receives the money, and B at the time, being a foreigner perhaps or for some other reason, understood that he was buying horses, all which A knew, nevertheless B could not claim horses under the contract. He could, by proving his mistake and A's knowledge of it, make out a case of fraud, and this would annul the contract, and then he could recover his money. But the reason why he could do no more is, that the law will not, under pretence of construing a contract, make a new contract for the parties. Hence, it is another way of expressing the same rule, that the actual intention of the parties to a contract shall be carried into effect, so far as it is possible to arrive at that intention by a rational construction of the words they have actually used, but no fur-

ther; for it is one of the most reasonable, safe, and well established rules, that no evidence from without a written contract shall be permitted to control or vary it. While parties are negotiating they may change their minds and vary their demands and concessions, and generally do this to some extent. But when they have finally put their terms in writing, the law supposes that these are what they have concluded upon, and that they have chosen and used the very words which express their meaning; and that whatever is not therein stated, although it may have previously passed between them, has been purposely omitted because it was not finally agreed to. It would therefore be manifestly unjust to permit evidence of any of these things to come forward and vary the written contract; and hence the rule, which is concisely expressed in the Scotch law thus: "Writing cannot be cut down or taken away by the testimony of witnesses." But while evidence must not vary, it may explain the contract. Thus, in the most solemn deed, it may be necessary to explain the terms of the instrument, in order to show who the parties are, what the boundaries of land mean, or where it is situated. But it is a very different thing when one of the parties says that the deed contains a mistake; that the house or the field it conveys is not the house or field which it was intended to convey; and on this ground demands to hold the house or field which, as he alleges, should have been given to him. And it may be regarded as the established rule concerning mistakes, that any mistake in an instrument may be corrected by construction, if the instrument itself affords the means of correction; but not, if it can be done only by going outside of the instrument. Courts of equity, however, have large powers to reform conveyances and contracts where by mistake in drafting them they are made to express a different intent from the one agreed upon. (See CHANCERY, and EQUITY.)

MISTLETOE (Anglo-Saxon *mistiltan*, from *mistl*, different, and *tan*, twig, as the plant is unlike the tree upon which it grows), a parasitic evergreen shrub of the family *Loranthaceae*. The true European mistletoe is *viscum album*, the generic name being the Latin word for the plant as well as for bird lime. The family comprises about 30 genera of mostly tropical evergreen shrubs, all of which are parasitic, and some of which have showy flowers; a description of the less conspicuous mistletoe will give the general characters of the whole family. The genus *viscum*, besides the common European one, comprises a few Asiatic species. The mistletoe is succulent when young, but becomes woody when old; its branches are repeatedly forked, and form together dense tufts 1 to 2 ft. in diameter, and attached to the branches of the trees by the thickened base of its main stem; the branches break readily at the distinct joints, at each of which is borne a pair of opposite, sessile, thickish leaves, which

vary from narrowly oblong to obovate, but are always entire and obtuse; the flowers are dioecious, nearly sessile in the forks of the branches; those in the male plant three to five together in a somewhat cup-shaped involucre, with short, thick, triangular petals, and the



Mistletoe (*Viscum album*).

same number of stamens, which are sessile in the centre of the petals, their anthers opening by several pores; the female or pistillate plant has its flowers solitary, rarely two or three together, and consisting of four minute petals at the top of the ovary, which is one-celled, with a simple style, and in ripening forms a white, semi-transparent berry with a single seed, surrounded by an exceedingly viscid or glutinous pulp. The mistletoe extends from Sweden to the Mediterranean, and is very common in the southern and western counties of England, where it grows upon a great variety of trees; it especially affects the apple, and in the cider districts is very destructive to the trees, as when once established it continues to grow as long as there is any life in its host. It is supposed to be disseminated by birds which feed upon the berries, and that in their attempts to wipe the viscid pulp from their bills they attach the seeds to the bark of the branches. To establish the plant artificially, a small slit of the bark is raised with a knife and the seeds are placed beneath it; this is done upon the under side of a branch to hide the seed from birds. Many experiments have been made upon the germination of this plant, and it is found that, in whatever position the seed may be placed, the radicle, which in ordinary plants tends directly downward, will be directed toward the surface to which the seeds are attached, without reference to gravitation, light, or any other influence. The radicle is frequently obliged to arch itself over to reach the bark, and when it comes in contact with this its end expands to form a disk which gives it a firm hold; from this proceed roots which

penetrate the bark, and thus place the young plant in contact with that portion of the tree where nutriment is most abundant. An instance is recorded of the growth of one specimen upon another mistletoe. The plant does not grow in the north of England or in Scotland and Ireland, and nurserymen there plant the seeds upon the bark of young apple trees, and sell the trees with the mistletoe already established upon them. The superstitions and legends connected with the mistletoe are numerous; it was held in high veneration by the ancient Britons, and its collection by the druids was accompanied with great solemnity; the plant is found more rarely upon the oak than upon any other tree, hence that which grew on the oak was regarded with peculiar honor; it was cut on the sixth day after the first new moon of each year, the priest using a golden sickle; the plant was received upon a white cloth and divided among the people, who preserved the fragments as a charm to protect them from disease and every other evil. In England it is used among Christmas decorations, and during the festivities, if a gentleman discovers a lady beneath the "mistletoe bough" he has a right to a kiss; this is a very old custom which has descended from feudal times, but its real origin and significance are lost. Within recent times the mistletoe has been regarded as a valuable remedy in epilepsy and other diseases, but at present it is not employed. The chief use of the plant is for holiday decorations, for which purpose it is occasionally brought to this country; its berries were formerly used to prepare bird lime, and the leaves have been fed to sheep in times of scarcity of other forage.—The American mistletoe, which was first described as a *viscum*, is so different from the European that Nuttall made a new genus for it, *phoradendron* (Gr. *φῶρ*, a thief, and *δένδρον*, a tree); it differs from *viscum* in having both kinds of flowers in short catkin-like, jointed spikes, and sunk in the joints; there is also a difference in the structure of the anthers. The plant has the same manner of growth, and is similar in general appearance to the European, but the leaves and stems are of a more yellowish green; the berries are white. There are several species of *phoradendron*, the most common being *P. flavescens*, which grows from New Jersey and Illinois to Texas and Mexico; there are several varieties, differing in the shape and smoothness of their leaves; it grows upon various deciduous trees, and in Texas is especially abundant on the mezquite, upon which it often grows in such quantities as to hide the proper foliage of the tree. There are half a dozen other species, all belonging to the far south and west.—Another related genus is *arceuthobium*, the species of which are small, much branched, leafless, and like the others parasitic. *A. oxycedri* is found on various coniferous trees from California to New Mexico, and further north it extends eastward to Hudson bay. In 1871 Mrs. Millington

discovered in Warren co., N. Y., a minute species of *arceuthobium* growing upon the branches of the black spruce (*abies nigra*), and about the same time it was discovered by Prof. Peck of Albany. The plant is scarcely more than an inch long, but occurs in such quantities as to seriously injure the trees; it is probably a form of *A. campylopodium*.

MISTRAL, Frédéric, a French poet, born at Maillane, near St. Remy, Provence, Sept. 8, 1830. He studied at Lyons and Avignon, where he graduated in jurisprudence, but devoted himself to poetry in his native village. His principal work is the pastoral Provençal epic *Mirèio* (*Mireille*), with a French text (Avignon, 1859; enlarged ed., 1862; English translation by H. Crichton, London, 1868, and by Harriet W. Preston, Boston, 1872), for which he received in 1861 an academical prize of 2,000 francs, and which has been set to music by Gounod as a comic opera. He published *Calendari*, a poem, in 1867. In September, 1868, great literary and social entertainments were given at St. Remy in honor of Provençal poetry, in which he took the most prominent part.

MITAU, or *Mittau* (Russ. *Mitavo*; Lettish, *Yelgava*), a town of Russia, capital of Courland, situated in a low marshy district on the Aa, 25 m. S. W. of Riga; pop. in 1867, 23,100, chiefly Germans, and including upward of 5,000 Jews. It is well built, and contains one Reformed, one Greek, one Roman Catholic, and three Lutheran churches, three synagogues, a gymnasium with a museum of physical science and natural history, a library, and various educational and charitable institutions, besides the buildings of the local authorities. Near Mitau is a palace built by Biron on the site of the original castle, after the model of the czar's Winter palace, where Louis XVIII. resided for a long time under the name of the count de Lille. There is an extensive trade in grain, flax, and linseed, which are sent hither from the interior of Courland and Lithuania for shipment on the Aa to Riga. The nobility of Courland reside here in winter, but Mitau is especially lively about St. John's day, when transactions are closed both by the nobles and the traders.

MITCHEL, John, an Irish revolutionist, born at Dungiven, county Derry, Nov. 3, 1815. His father was a Unitarian clergyman. He graduated at Trinity college, Dublin, in 1836, studied law, and practised for six years in Newry and Bannbridge, during O'Connell's agitation. In 1845 he was called to Dublin to succeed Thomas Davis in the editorship of the "Nation." His articles were revolutionary, and for one which appeared in 1846, showing how the people could contend with the army, the "Nation" was prosecuted by government. In consequence of differences in policy he quarrelled with his partner Gavin Duffy toward the end of 1847, and soon after founded the "United Irishman," which brought him in direct collision with the government. After an existence of three

months the journal was suppressed, and its editor sentenced to expatriation for 14 years. On May 27, 1848, after two weeks' incarceration at Newgate, Mitchel was taken in irons from Dublin to Spike island (Cork harbor), where a government order, was received to treat him "as a person of education and a gentleman." Taken thence in a day or two, he passed 10 months in the island of Bermuda, whence he was again deported to Australia. Here he met Smith O'Brien, Meagher, and other political associates. On July 19, 1854, Mitchel resigned his parole and escaped from the colony, landing in New York on Nov. 29. There he founded the "Citizen," a weekly journal, which he conducted until failing eyesight constrained him to seek a more congenial climate. He removed to Tennessee, where he established the "Southern Citizen," in which he advocated the reopening of the slave trade. He edited the Richmond "Examiner" during the civil war, after which he settled in New York. In July, 1874, he made a visit to Ireland, returning in October. In February, 1875, he was elected to parliament for Tipperary, though disqualified for a seat by his uncancelled sentence, and again went to Ireland. He is the author of "Hugh O'Neill," his own "Jail Journal" (New York, 1854), "The Last Conquest of Ireland (perhaps)" (Dublin, 1861), and a continuation of MacGeoghegan's "History of Ireland." He has also edited the poems of Thomas Davis and James Clarence Mangan, with biographies.

MITCHEL, Ormsby Macknight, an American astronomer, born in Union co., Ky., Aug. 28, 1810, died at Beaufort, S. C., Oct. 30, 1862. At 12 years of age, with a good knowledge of Latin and Greek and the elements of mathematics, he became clerk in a store in Miami, O., and afterward removed to Lebanon, Warren co., where he had been educated. Being appointed a cadet, he earned the money that took him to West Point, which place he reached almost penniless in June, 1825. After graduating in 1829, he was acting assistant professor of mathematics for two years. From 1832 to 1834 he was a counsellor at law in Cincinnati; from 1834 to 1844 professor of mathematics, philosophy, and astronomy in Cincinnati college; in 1836 and 1837 chief engineer of the Little Miami railroad. An observatory having been erected at Cincinnati chiefly through his exertions, he became its director; and in 1859 he took the direction of the Dudley observatory at Albany, retaining his connection with that at Cincinnati. In August, 1861, he was commissioned brigadier general of volunteers, and assigned to the department of the Ohio. After the occupation of Bowling Green and Nashville, he made a forced march into Alabama, fought a battle near Bridgeport at the close of April, 1862, and seized the railroad between Corinth and Chattanooga, for which he was promoted to the rank of major general. In July he was relieved of his command in the west, and in September was

placed in command of the department of the South, where he was preparing for an active campaign when he died of yellow fever. He was a popular lecturer on astronomy, and scarcely less distinguished for his mechanical skill, by which he perfected a variety of astronomical apparatus, among the most important of which was that for recording right ascensions and declinations to within $\frac{1}{1000}$ of a second of time. Among his discoveries are the exact period of rotation of Mars, and the companion of Antares or Cor Scorpii. He also remeasured W. Struve's double stars S. of the equator, which resulted in several interesting discoveries. He published "Planetary and Stellar Worlds," a collection of lectures, a treatise on algebra, and a "Popular Astronomy." In 1846-'8 he published "The Sidereal Messenger," a periodical.

MITCHELL. I. A N. W. county of North Carolina, bordering on Tennessee, bounded S. W. by the Nolichucky river; area, about 530 sq. m.; pop. in 1870, 4,705, of whom 213 were colored. It lies between the Blue Ridge and Iron mountains. In 1867 five valuable mica mines were discovered in this county, which have since been extensively worked, and the trade has enabled the inhabitants to pay off the entire debt of the county. The chief productions in 1870 were 12,530 bushels of wheat, 6,065 of rye, 72,860 of Indian corn, 21,311 of oats, 8,483 of potatoes, 8,725 lbs. of wool, and 35,760 of butter. There were 665 horses, 1,416 milch cows, 2,207 other cattle, 5,142 sheep, and 6,889 swine. Capital, Bakersville. **II.** A S. W. county of Georgia, bounded N. E. by Flint river; area, about 500 sq. m.; pop. in 1870, 6,633, of whom 2,950 were colored. The surface is level and the soil fertile. It is traversed by the Albany division of the Atlantic and Gulf railroad. The chief productions in 1870 were 150,526 bushels of Indian corn, 26,240 of oats, 21,382 of sweet potatoes, 39,860 lbs. of butter, 4,708 bales of cotton, and 21,412 gallons of sorghum molasses. There were 2,133 milch cows, 4,121 other cattle, 2,092 sheep, and 7,186 swine. Capital, Camilla. **III.** A N. county of Iowa, bordering on Minnesota and intersected by the Red Cedar river and its E. fork; area, 431 sq. m.; pop. in 1870, 9,582. It is intersected by the Burlington, Cedar Rapids, and Minnesota railroad. The chief productions in 1870 were 564,894 bushels of wheat, 150,847 of Indian corn, 358,105 of oats, 33,804 of barley, 36,141 of potatoes, 8,906 lbs. of wool, 194,060 of butter, and 15,415 tons of hay. There were 2,600 horses, 2,986 milch cows, 5,685 other cattle, 2,440 sheep, and 2,603 swine; 2 manufactories of agricultural implements, 6 of carriages and wagons, 1 of iron castings, 1 of patent medicines, 1 woollen mill, 3 saw mills, and 1 flour mill. Capital, Mitchell. **IV.** A N. central county of Kansas, intersected by Solomon river; area, 720 sq. m.; pop. in 1870, 485. The surface is undulating, and consists mostly of fertile prairies. The chief pro-

duction in 1870 was 6,250 bushels of Indian corn. The value of live stock was \$56,377. Capital, Beloit.

MITCHELL, Donald Grant, an American author, born in Norwich, Conn., in April, 1822. He graduated at Yale college in 1841, travelled in Europe, studied law in New York, and in 1847 published, under the pseudonyme of "Ik Marvel," "Fresh Gleanings, or a New Sheaf from the Old Fields of Continental Europe." He was in Europe in 1848, and wrote "The Battle Summer" (New York, 1849). This was succeeded by a satirical work entitled "The Lorgnette," which appeared anonymously (2 vols., 1850). In the same year appeared "The Reveries of a Bachelor," and in 1851 his "Dream Life." In 1853 he became United States consul at Venice, in 1855 returned, and has since resided on his farm of "Edgewood," near New Haven. He was for some time associate editor of the "Hearth and Home," New York, and has frequently appeared as a lecturer. His later publications are: "Fudge Doings" (2 vols., 1854); "My Farm of Edgewood" (1863); "Wet Days at Edgewood" (1864); "Seven Stories, with Basement and Attic" (1864); "Doctor Johns" (2 vols., 1866); "Rural Studies" (1867); and "Pictures of Edgewood" (fol., 1869).

MITCHELL, Elisha, an American chemist, born at Washington, Litchfield co., Conn., Aug. 19, 1793, died on the Black mountains in North Carolina, June 27, 1857. He graduated at Yale college in 1813, and in 1818 became professor of mathematics in the university of North Carolina, and in 1825 of chemistry. In 1821 he was ordained a Presbyterian minister. He was for some time state surveyor. He first ascertained that the mountains of North Carolina are the highest east of the Rocky mountains. (See BLACK MOUNTAINS.) To settle some disputed points in regard to these heights, he reascended them in 1857, lost his way at night, fell down a precipice, and was killed.

MITCHELL, I. John Kearsley, an American physician, born at Shepherdstown, Jefferson co., Va., May 12, 1798, died in Philadelphia, April 4, 1858. He was educated in Scotland, graduated M. D. at the university of Pennsylvania in 1819, made three voyages to China as ship's surgeon, and in 1822 began to practise medicine and teach physiology in Philadelphia. In 1826 he became professor of chemistry in the Philadelphia medical institute, in 1833 in the Franklin institute, and in 1841 of the theory and practice of medicine in the Jefferson medical college. He published "Indecision, and other Poems" (Philadelphia, 1839), "On the Cryptogamous Origin of Malarious and Epidemical Fevers" (1849), and several popular scientific lectures. After his death appeared a selection from his papers entitled "Five Essays," &c. (1858). **II. S. Weir**, an American physician, son of the preceding, born in Philadelphia, Feb. 15, 1829. He graduated at Jefferson medical college in 1850. His earlier

researches were chiefly in toxicology, and are especially authoritative on the venom of serpents. His later writings have been almost entirely devoted to diseases of the nervous system. He has published, with G. R. Morehouse, M. D., and W. W. Keen, M. D., "Gun-shot Wounds and other Injuries of the Nerves" (Philadelphia, 1864), and "Injuries to Nerves, and their Consequences" (1871); and he has also made numerous contributions to scientific journals, including "Experimental Researches relative to Corroval and Vao, American Arrow Poisons," with W. A. Hammond, M. D. ("American Journal of Medical Sciences," 1859); "Toxicological Study of Ordeal Poisons, Sassy Bark" ("Charleston Medical and Surgical Journal," 1859); "Researches on the Venom of the Rattlesnake" ("Smithsonian Contributions to Knowledge," 1860); "Treatment of Rattlesnake Bites" ("North American Medical and Chirurgical Review," 1861); "On the Circulation in Chelonura Serpentina" ("Memoirs of the American Philosophical Society," 1862); "Arsenical Albuminuria" ("New York Medical Journal," 1865); "Antagonism of Atropia and Morphia," with Drs. Morehouse and Keen ("American Journal of the Medical Sciences," 1865); "Palsy from Peripheral Irritations" ("New York Medical Journal," 1866); "Production of Spasms from Cold to the Skin" ("American Journal of the Medical Sciences," two papers, 1867-'8); and "Experimental Contributions to the Toxicology of Rattlesnake Venom" ("New York Medical Journal," 1868).

MITCHELL, Maria, an American astronomer, born in Nantucket, Aug. 1, 1818. She derived from her father, who taught a school in Nantucket, a fondness for astronomy, and by her intelligence in the use of instruments and her mathematical attainments soon became an enthusiastic coöperator in his labors. Subsequently she made many careful observations by herself, and devoted much time to the examination of nebulae and the search for comets. On Oct. 1, 1847, she discovered a telescopic comet, for which she received a gold medal from the king of Denmark. She has been employed in observations connected with the coast survey and in compiling the nautical almanac. She is a member of the American association for the advancement of science, and was the first female member of the American academy of arts and sciences. In 1865 she was appointed to the chair of astronomy in Vassar college, Poughkeepsie, N. Y.

MITCHELL, Sir Thomas Livingstone, a British engineer, born in Stirlingshire, Scotland, in 1792, died near Sydney, Australia, Oct. 5, 1855. He joined the British army in the peninsula in 1808, attained the rank of major, and made military maps of the peninsular battle fields. In 1827 he was appointed deputy surveyor general of eastern Australia, and ultimately surveyor general, which office he held till his death. He conducted four expeditions into the interior of

Australia; the first, in 1831-'2, resulted in the discovery of the Peel and Nammoy rivers; and during the second and third, in 1835-'6, the Darling and Glenelg rivers were explored, and Australia Felix discovered. The fourth (1845-'6) was undertaken to trace out a route from Sydney to the gulf of Carpentaria; the loss of cattle and horses prevented the completion of the expedition, but it led to the discovery of the Victoria river. During a visit to England Major Mitchell published "Three Expeditions into the Interior of Eastern Australia, with Descriptions of the recently explored Region of Australia Felix," &c. (2 vols. 8vo, London, 1838); and his "Journal of an Expedition into the Interior of Tropical Australia" appeared in 1848. In 1853 he published a lecture on the boomerang propeller, which he had invented for steam vessels. He was knighted in 1839, and made a colonel in 1854.

MITCHELL'S PEAK. See BLACK MOUNTAINS.

MITCHILL, Samuel Latham, an American physician, born in North Hempstead, Long Island, Aug. 20, 1764, died in New York, Sept. 7, 1831. He graduated as M. D. at the university of Edinburgh in 1786, returned to America in the following year, and studied law. In 1792 he was appointed professor of chemistry, natural history, and philosophy in Columbia college, where his dissent from some of Lavoisier's principles involved him in a controversy with Dr. Priestley, which led to a lasting friendship between the two disputants. In 1796 he made a geological and mineralogical tour along the Hudson. In conjunction with Dr. Edward Miller and Elihu H. Smith he founded the quarterly "Medical Repository," of which he continued to be editor for 16 years. It was the first scientific periodical published in the United States. Twice he was a member of the legislature, and in 1801 he became a representative in congress, and in 1804 United States senator. At the expiration of his term of office he was again elected to the house of representatives. In 1808 he became professor of natural history in the college of physicians and surgeons, and in 1820 of botany and materia medica. In 1826 the institution gave place to the Rutgers medical school, of which Dr. Mitchell became vice president. The poems of "Croaker and co." contain records of some of Dr. Mitchell's eccentricities. He proposed to change the name of this country to Fredonia, and wrote in 1804 "An Address to the Fedres, or People of the United States." He was the author of "Observations on the Absorbent Tubes of Animal Bodies" (12mo, New York, 1787); "Nomenclature of the New Chemistry" (1794); "Life, Exploits, and Precepts of Tammany, the famous Indian Chief," a half historical, half fanciful address before the Tammany society of New York (1795); and "Synopsis of Chemical Nomenclature and Arrangement" (1801).—See "Reminiscences of Samuel Latham Mitchell, M. D., LL. D.," by John W. Francis, M. D. (New York, 1859).

MITÉ, a name applied to many very small articulated animals, of the arachnoid order and suborder *acarina*, including the ticks, itch insects, and other parasites, and the minute acari. The abdomen is unarticulated, and fused with the cephalothorax; the external envelope is of chitine, solid and indestructible; four pairs of feet on the cephalothorax, armed with nails, and in some provided with long pedunculated disks by which the animal is attached; some, when young, have six feet; eyes usually absent; mandibles wanting, the antennæ being changed into prehensile and masticatory organs, moving vertically, piercing or cutting as may be necessary, and sometimes enclosed in a sheath in the form of a sucker. The stomach has several cæcal appendages, and the short and straight intestine opens near the middle of the abdomen; salivary glands well developed; no apparent heart nor blood vessels, the colorless nutritive fluid filling all the interstices of the body, and being irregularly circulated by the muscular movements and the contractions of the intestinal canal; respiration aërial, performed chiefly by the skin, and in some by trachææ. The sexes are separate; many have an ovipositor, by which they insert their eggs under the epidermis of plants and animals, in the latter case often causing great irritation; some surround their eggs by a tough substance which glues them to various objects. Their extreme minuteness in some cases may be judged of by the fact that they infest flies and very small insects; they are exceedingly prolific. Some live under stones, others on plants, on animals, or among decaying organic substances, and a few are aquatic; the parasitic ones, sucking the blood of animals and man, are sometimes very annoying. The itch insect has been described under *ITON*, and the ticks and other mites under *ERIZOA*. Among the mites, the *acarus domesticus* is found especially in old cheese (the powder of which, so agreeable to epicures, is made up of these little animals with their eggs and excrement), in flour, sugar, and on figs and sugared fruits; the *A. destructor* feeds on the specimens of the entomologist and zoologist; the garden mites (*trombididæ*) live on fruits, flowers, and leaves; the spider mites (*gamasidæ*) include the minute red spider of hothouses; and the wood mites (*oribatidæ*) creep among stones and moss.



Mite (*Acarus domesticus*).

MITFORD, Mary Russell, an English authoress, born at Alresford, Hampshire, Dec. 16, 1786, died near Reading, Jan. 10, 1855. She was the daughter of a physician whose pecuniary speculations early involved his family in ruin. Her education was chiefly acquired at a school in Chelsea. At 20 years of age she published three volumes of poems, some of them long narratives in the style of Scott; and about 1812 she adopted literature as a profession,

and for several years contributed tales and sketches to the magazines and annuals. Irving's "Sketch Book" first suggested to her the idea of writing sketches of the daily life of the rural population, and her most popular work is "Our Village," the scene of which is the little hamlet of Three Mile Cross, near Reading. These sketches, after being declined by the "New Monthly Magazine," edited by Thomas Campbell, were first published in the "Lady's Magazine" about 1820, and were extended to five volumes or series (1824-'32). Among her other prose works are "Country Stories" and several of the "Edinburgh Tales" published by Mrs. Johnstone in 1845. She also edited three volumes of "Stories of American Life by American Authors," and four of the annual volumes of Finden's "Tableaux." Her dramas, "Julian" (1823), "Foscari" (1826), "Rienzi" (1828), and "Charles the First," were performed with success, "Rienzi" being the most popular. Her "Charles the First" was prohibited by George Colman, the licenser, for its supposed revolutionary sentiments, but was finally produced at the Coburg theatre in London. She also wrote several dramas which were never acted, and an opera, "Sadak and Kalasrade," the music of which was written by Packer. In 1838 she received a pension. In 1852 appeared her "Recollections of a Literary Life" (3 vols. 12mo), and in 1854 "Atherton and other Tales," and a collected edition of her dramatic works in two volumes. For upward of 40 years she lived in a little cottage in Berkshire. About three years before her death she was injured by the overturning of her chaise, and the remainder of her life was passed in much physical suffering.—See "Life of Mary Russell Mitford," edited by the Rev. A. G. L'Estrange (3 vols., London, 1870).

MITFORD, William, an English historian, born in London, Feb. 10, 1744, died in Hampshire, Feb. 8, 1827. He entered Queen's college, Oxford, left it without a degree, studied law at the Middle Temple, but soon retired to his ancestral estate in Hampshire, married, and devoted himself to literature. By the advice of Gibbon, he wrote a history of Greece (5 vols., 1784-1818), bringing the narrative down to the death of Alexander the Great. He was prevented by age and failing eyesight from carrying on the work, as he had intended, to the period of the Roman conquest. An edition of it by his brother Lord Redesdale, with an introduction, appeared in 1829 (8 vols. 8vo). He also published a treatise on the religions of ancient Greece and Rome, as a supplement to his history; "An Inquiry into the Principles of Harmony in Languages and of the Mechanism of Verse, Modern and Ancient" (1774); and "A Treatise on the Military Force, and particularly the Militia, of this Kingdom." He was a member of parliament for 21 years, held several public offices, and was professor of ancient history in the royal academy.

MITHRIDATES, or *Mithradates*, a king of Pontus, the sixth of the name, surnamed Eupator and the Great, born about 132 B. C., died in 63. He ascended the throne in 120. He subdued the barbarians between the Euxine and the Caspian, extended his conquests among the tribes beyond the Caucasus, rendered the Tauric Chersonese tributary, and on the death of Parysades, king of Bosphorus, annexed that country to his dominions. He next expelled the kings of Cappadocia and Bithynia, dependent allies of Rome, from their dominions, but the Romans promptly restored them. Nicomedes the Bithynian was not content with recovering his kingdom, but invaded the dominions of Mithridates, who, failing to obtain redress from Rome, immediately commenced hostilities against her generals and allies. In 88 he again expelled the Cappadocian and Bithynian sovereigns, defeated the Roman armies that attempted to support them, made himself master of Phrygia and Galatia, overran the whole Roman province of Asia, and ordered its Roman citizens to be massacred to the number, it is said, of 80,000. When these things were known at Rome, Sulla was appointed to command the armies sent against Mithridates, who transferred the seat of war to Greece, where his general Archelaus suffered two great defeats at Chæronea and Orchomenus in 86, while the king was himself defeated in Asia by Fimbria, and was compelled to abandon his conquests there, to pay an indemnity of 2,000 talents, and to surrender all his ships to the Romans (84). The events of what is called the second Mithridatic war are not of much interest; the death of Nicomedes III., king of Bithynia, in 74, was the signal for the outbreak of the third. That monarch had bequeathed his dominions to the Roman people, and Bithynia was pronounced by the senate a Roman province. Mithridates attempted to place a pretended son of the deceased king on the throne. Entering Bithynia at the head of an army of over 120,000 foot and 16,000 horse, he vanquished the consul Cotta at Chalecedon, and then proceeded to lay siege to Cyzicus; but he was compelled by Lucullus to retreat with great loss into Pontus. After completely defeating another vast army, Lucullus drove Mithridates from his kingdom. A mutiny of the Roman legions, however, enabled him to recover Pontus. In 66 Lucullus was superseded by Pompey, and the war was resumed. Mithridates was surprised and totally defeated, and with a handful of troops retreated north to Panticapæum (now Kertch, in the Crimea), the capital of Bosphorus. Here he was safe from the Romans; but while he was planning schemes of aggression against Rome, his son Pharnaces rebelled, and was proclaimed king by the soldiers and citizens. Mithridates, on learning this, took refuge in a strong tower, where he sought to end his life by poison; but this proving ineffectual, he ordered one of his Gallic mercenaries to de-

spatch him with his sword. It is said that to avoid being poisoned, which he was apprehensive of, he had accustomed himself to the use of antidotes to such a degree that the most baneful drugs had little effect on him. His son sent his body to Amisus as a peace offering to Pompey; but the Roman general caused it to be interred with regal honors in the sepulchre of the Pontic kings at Sinope. Mithridates had a powerful memory, was well acquainted with Greek literature, and understood more than 20 languages which were spoken in his dominions.

MITRAILLEUSE. See ARTILLERY, vol. i., p. 792.

MITRE (Gr. *μίτρα*), an ornament worn upon the head by certain ecclesiastics of the Roman Catholic and Greek churches, consisting of a



Persian Mitra, from a Pompeian Mosaic.



Greek Mitra, from a Bust at Dresden.

stiff cap rising in two points, one before and the other behind, and having two ribbon-like pendants which fall on the shoulders. In the strict generic sense, the ancient mitra was a scarf which was sometimes bound around the thyrsus of Bacchus and his votaries in the celebration of his rites. In a secondary sense, it was a scarf worn like a turban by the Persians and Arabians, and by the women of Greece.



Phrygian Mitra, from a Pompeian Painting

The mitra worn by the Phrygians and Amazons was a pointed cloth cap tied by strings or lappets under the chin. Bacchus was often represented with a mitra, from which the Greeks gave him the name *μυροφόρος*. The Persian deity Mithra and the Egyptian god

Osiris appear with a similar head covering, and it has also been traced in India. The Jewish high priests wore the *mitzenepheth*, which was copied from the mitra made for Aaron (Exod. xxviii.), on the front of which, over a blue lace, was a plate of pure gold, having engraven on it, "like the engravings of a signet, Holiness to the Lord." When the mitra was first adopted by Christian ecclesiastics is uncertain, but it is supposed that its first form was a circlet of silver gilt or of gold, set sometimes with precious stones, and called *στέφανος* or *corona*, and *κίδαρις* or *diadema*. In the 6th century John of Cappadocia, bishop of Constantinople, added

to this band embroidered fringes and sacred images. In the western churches a white linen kerchief was worn, tied behind by a bandage, the ends of which fell on the shoulders. In the beginning of the 8th century it was customary to wear both the kerchief and the corona. In the latter part of the 10th century the mitra was a close-fitting cap with a round top; in the 11th the horns began to show themselves in two short points on the sides above each ear; and in the 12th century these had grown into low round protuberances. Toward the beginning of the 13th century the mitra took a different shape, the two horns being more elevated and worn in front and behind, as at present. At the period of the renaissance it assumed its present bulging shape and undue height. Three kinds of mitres are now used in the Roman church: the precious mitra, often made of gold or silver and adorned with gems; the gold-embroidered mitra, made of cloth of gold or white silk embroidered with gold; and the plain mitra, of white damask or linen, with red edging or fringe on the lappets. The use of the mitra is not restricted to bishops; cardinals, abbots of great houses by special papal privilege, and canons of highly favored cathedrals or royal collegiate churches, are allowed to wear it. In the English church the mitra has not been worn since the coronation of Queen Elizabeth.



Bishop's Mitra.

MITSCHERLICH, Eilhard, a German chemist, born at Neuende, near Jever, grand duchy of Oldenburg, Jan. 7, 1794, died in Berlin, Aug. 28, 1863. He was the son of a clergyman, and studied at the gymnasium of Jever, where Schlosser instructed him in oriental history and philology. He pursued his studies especially in this department at Paris, Heidelberg, and Göttingen, where he published *Mirchondi Historia Thaheridarum* (1815); and in 1818 he went to Berlin to study chemistry. He discovered the law of isomorphism, for which he received the medal of the royal society of London. At the invitation of Berzelius he accompanied him to Stockholm in 1819, and passed two years in his laboratory. On his return to Berlin, he succeeded Klaproth in the academy of sciences and in the chair of chemistry. His first results in the discovery of isomorphism were presented to the Berlin academy in 1819, and next year they were generally accepted. Its doctrine was developed by him in a long series of observations. In 1823 he completed the theory by the discovery that some substances, as sulphur and carbon, under different circumstances, crystallize in two dissimilar forms. Such bodies are termed dimorphous. The reports of his

investigations and discoveries are chiefly contained in a large number of papers in the journals of the Berlin academy and in the *Annalen* of Poggendorff. He also published *Lehrbuch der Chemie* (Berlin, 1829-'40; 5th ed., 1853 *et seq.*). He perfected the instruments for measuring the angles of crystals, and extended his researches to the influence of heat on crystallization. Many instruments of his invention have been adopted in Germany and other countries. He was one of the few foreign associates of the French institute. His posthumous work *Ueber die vulkanischen Erscheinungen in der Eifel und über die Metamorphie der Gesteine durch erhöhte Temperatur*, edited by J. Roth, was published in Berlin in 1865. See Rose's *Gedächtnissrede* (Berlin, 1864).—His brother, KARL GUSTAV (born Nov. 9, 1805, died March 16, 1871), was professor of medicine at the university of Berlin. His principal work is *Lehrbuch der Arzneimittellehre* (3 vols., Berlin, 1847-'61).

MITTERMAIER, Karl Joseph Anton, a German jurist, born in Munich, Aug. 5, 1787, died in Heidelberg, Aug. 28, 1867. He studied at Landshut and Heidelberg, was for many years professor in the former university, and in 1819 removed to Bonn. In 1821 he accepted the chair of jurisprudence at Heidelberg, which he retained until his death. He defended trial by jury in Germany, and sustained (theoretically) the codification of the French civil law against the attacks of Hugo, Savigny, and others. His *Lehrbuch des deutschen Privatrechts* (Landshut, 1821) was subsequently merged in his *Grundsätze des gemeinen deutschen Privatrechts, mit Einschluss des Handel-, Wechsel- und Seerechts* (2 vols., Ratisbon, 1837-'8). His first work on criminal law, *Handbuch des peinlichen Prozesses* (2 vols., Heidelberg, 1810-'12), was republished, enlarged and modified, under the title of *Das deutsche Strafverfahren in der Fortbildung durch Gerichtsgebrauch und Particulargesetzgebung* (2 vols., 1832), and has passed through many editions. The principles relating to the examination of witnesses in criminal law are expounded in his *Theorie des Beweises im peinlichen Prozesse* (2 vols., Darmstadt, 1821), in *Die Lehre vom Beweise im deutschen Strafprozeß* (1834; French translation, 1848; Spanish, 1851), and in his *Anleitung zur Vertheidigungskunst im Criminalprozeß* (translated into Italian by Garba, 1858). His manual of criminal law (*Lehrbuch des Criminalprozesses*) has passed through numerous editions. A comprehensive exposition of the principles upon which civil trials should be conducted is contained in his *Der gemeine deutsche bürgerliche Prozess* (1820-'26). His *Die Mündlichkeit, das Anklageprincip, die Öffentlichkeit und das Geschwoorengericht* (Stuttgart, 1845), brings the investigation and the enactments relating to trial by jury down to the period of its publication; and his *Das englische, schottische und nordamerikanische Strafverfahren* (Erlangen, 1851), treats of the

administration of justice in England, Scotland, and the United States. His subsequent works include *Die Gefängnisverbesserung* (1858); *Der gegenwärtige Zustand der Gefängnisfrage* (1860); *Die Todesstrafe, &c.* (Heidelberg, 1862); and *Erfahrungen über die Wirksamkeit der Schwurgerichte in Europa und Amerika* (1865). Mittermaier was a member of the Baden legislature for nearly 20 years previous to 1841, when his grief at the death of his son caused him to withdraw; during that time he had been three times president of the legislature; and having resumed his seat in 1846, he was again president during the session of 1847-'8. In 1848 he was first called upon to preside over the provisional parliament at Frankfurt; and he was a member of the German parliament, where he advocated confederation, but opposed all extreme measures. He frequently visited Italy, and embodied the result of his observations in *Italienische Zustände* (Heidelberg, 1844).

MITTIMUS, in law, the precept which is addressed by competent judicial authority to a sheriff, constable, or other officer, and to a jailer or keeper of a prison, commanding the one to take and deliver, and the other to receive into custody, a person charged with the offence therein described, and safely keep him as therein commanded. The command to keep varies with the nature of the case. A mittimus may be issued by an examining magistrate who, having inquired into a charge of crime, has decided that there is probable cause to believe it true; and then, if the offence is bailable and sureties be not offered, a mittimus will issue commanding the jailer safely to keep the person charged for want of sureties, or until he be discharged by due course of law. But a mittimus may also issue for confinement in punishment of crime, and then the command will be safely to keep the prisoner for a time specified. A mittimus should be under the hand and seal of the magistrate; it should plainly specify the offence charged, and contain sufficient to show on its face that the magistrate had authority to act in the case; but it need not recite the evidence.

MITTOO, a country of central Africa, between the Roah and Rohl rivers, and between lat. 5° and 6° N., bounded N. by the territory of the Dinka and S. by that of the Nyamnyam. The most northerly group of tribes is that of the Mittoo proper; the other tribes are the Madi, the Madi-Kaya, Abbakah, and Loobah. Tattooing is practised only among the men. Both sexes wear iron and copper ornaments and trinkets of every sort; they have a great partiality for chains, for fastening objects to their bodies, and their inventive skill in armlets and rings for the ankles is remarkable. Thick chains of iron on the neck are signs of fashion and wealth, and the ambitious often wear four at a time. The country is fertile, especially between lat. 5° and 5° 30' N., on the upper Roah and Wohko,

and various cereals, tuberous plants, and oily and leguminous fruits are produced with little labor. They eat the flesh of dogs, and possess goats and poultry, but have no cattle, and are hence contemptuously called *Dyoor* or savages. They use the bow and arrow and spears, but not shields. They have been lately subjected to the authorities at Khartoom, and attempts have been made to employ them as "bearers," or attendants on military and trading expeditions, but with little success, owing to their general debility.—See Schweinfurth's "Heart of Africa" (2 vols., 1874).

MITYLENE. See MYTILENE.

MIXTECAS, a nation of Indians in Mexico, who emigrated at an early period from the north, under chiefs who were said to have sprung from two trees. They displaced the Chuchones or Chochoes, and occupied most of the present states of Oajaca, Guerrero, and Puebla. They were industrious and progressive, and were not governed by one ruler, but by independent chiefs. Some of the bands were reduced by the Aztecs, and paid them tribute in feathers, chalcibuiltl, cotton robes, maize, and firewood; but those of Oajaca remained independent. Remains of their cities, temples, and fortresses show that they possessed considerable civilization. They had sacred caves in their mountains, and believed in a heaven called Sosola. They have held their ground in part of the territory, but in Puebla have been displaced by Mexicans, and some bands were forced down into Guatemala. Their language is allied to the Zapoteca, but is more melodious and less difficult. It has several dialects, 11 according to recent authorities, of which the Tepuzculano is the principal. The language has no *b*, *f*, *p*, or *r*. It has no proper plural, *cahite*, equivalent to many, being added to the singular; it abounds in personal pronouns, and the negative particle varies according to the tense of the verb. A full dictionary was compiled by F. Diego Rio; an *Arte* or grammar was published at Mexico in 1593 by Fray Antonio de los Reyes; and several religious treatises were printed in Mixtecan in the 16th and 17th centuries. At present they are peaceable and intelligent Mexican citizens. Protected by mountain fastnesses, they take little part in revolutions occurring beyond their limits. Their chief cities are Huajuapán, Yanhuistlan, Tlaxiaco, and Tepascaluta.

MNEMONICS (Gr. *μνήμη*, memory), the art of rendering artificial aid to the memory by associating in the mind things difficult to remember with those which are easy of recollection, so that the former may be retained and brought to mind by association with the latter. The art is supposed by some writers to have originated with the Egyptians, but the first person who reduced it to a system was, according to Cicero, the poet Simonides of Cos (about 500 B. C.). Having been called from a banquet just before the roof of the house fell and crushed all the rest of the company, he found

on returning that the bodies were so mutilated that no individual could be recognized; but by remembering the places which they had severally occupied at table he was able to distinguish them. He was thus led to remark that the order of places may by association suggest the order of things. The principles of the art were introduced at Rome and developed by Metrodorus, and Cicero and Quintilian both advocated the plan of associating thoughts and words with particular places, images, or signs which might be recalled at pleasure. One of the earliest modern works on the subject is the *Fœnix* (1491) of Petrus Ravennas, professor of canon law in Padua. One of his artifices was to make beautiful maidens the letters of an alphabet. John Romberch de Krypse, in his *Congestorium Artificiosæ Memoriz* (1533), recommended the division of the walls of a series of rooms into separate spaces, each of which was to be marked with numerical, literal, and symbolical alphabets. The distinct rooms were to be devoted, like the alcoves of a library, to distinct classes of subjects; and the nomenclature having once been mastered, the suggestions of local relation would enable a man to repeat hundreds of words or ideas that had no real connection with one another. The same method is developed further in the "Castel of Memory" of Guilielmo Grataroli of Bergamo, published in English in 1562. The *Ars Memoriz* of Marafortius (1602) grouped all necessary reminiscences around 44 images contained in the palms of the hands. Giambattista della Porta, in his *Ars Reminiscendi* (1602), seems to have first employed the mode of writing now common in rebuses. About 1609 Lambert Schenkel astonished all classes in France, Germany, and the Netherlands by his mnemonic performances. His system, which was similar to that of Simonides, was obscurely explained in his *Gazophylacium Artis Memoriz* (1610). He was succeeded at the university of Paris, where he taught for many years, by his pupil Martin Sommer, who became equally celebrated. More elaborate than any preceding scheme was the repository for ideas suggested by John Wallis in his *Mnemoniaca* (1618). This repository was to be a series of imaginary theatre-shaped edifices with their interior walls variously divided and colored. Every person was to have his repository constantly present before his mind, within which all his ideas were to be arranged according to their qualities, quantities, positions, and colors. The plan only became more complicated as improved by Henry Herdson (1651). The *Memoria Technica* of Richard Grey (1730; new ed., 1851) contains a system which many have found useful in remembering dates and numbers. Letters are substituted for figures and combined into words; certain consonants are selected for this purpose, the vowels serving only to connect them. Grey's letters, which were adopted without reference to any similarity to the figures they stand for, are as follows:

1	2	3	4	5	6	7	8	9	0
b	d	t	f	l	s	p	k	n	z

Words formed from these letters by combination with any of the vowels are more easily numbered than the figures they represent. The most complicated system of mnemonics is that of Fainagle, who began to lecture in Paris in 1807 and in England in 1811. He divides the walls, ceiling, and floor of a room into 50 imaginary equal compartments. To each compartment is assigned a particular hieroglyphic, with which it is indelibly associated. These elements having been thoroughly mastered, some association, no matter how ridiculous, is formed between the object to be remembered and one of the hieroglyphs. The substitution of letters for figures also belongs to his system. His table is as follows:

1	2	3	4	5	6	7	8	9	0
t	n	m	r	l	d	ckgq	bvw	pf	szx

He selected these letters on account of some similarity to or association with the figure represented; as, for example, t resembles the figure 1, n with two strokes suggests 2, m with three strokes suggests 3, r occurs in the word denoting four in the European languages, &c. Fainagle published a work in English illustrative of his system, entitled "The New Art of Memory" (London, 1812). His system was improved by Aimée Paris (*Principes et applications diverses de la mnémotechnie*, 7th ed., Paris, 1833), who applied his method to chronology, geography, jurisprudence, mathematical formulas, and the nomenclature of all the sciences. Further modifications were made by F. Fauvel-Gouraud, who taught in the United States and published "Phreno-Mnemotechnic Dictionary" (part i., New York, 1844), and "Phreno-Mnemotechny, or the Art of Memory" (1845). Among other late writers on mnemonics are Gen. Bem, *Exposé général de la méthode mnémonique polonoise*, &c. (Paris and Leipsic, 1839), an enlargement of Jazwinski's system; Hermann Kothe, *System der Mnemonik* (Cassel, 1853); and Karl Otto-Reventlow, *Mnemotechnischer Commentar zur allgemeinen Weltgeschichte* (Stuttgart, 1861).

MNEMOSYNE (Gr.), in classical mythology, the goddess of memory, one of the Titanides, daughter of Uranus, who became by Jupiter the mother of the Muses.

MOA. See DINORNIS.

MOAB, the ancient name of a region on the E. shore of the Dead sea and the E. bank of the Jordan, about 50 m. long by 20 broad. It is designated in Scripture as the land of Moab. The plains are well watered and very productive. The uplands consist of a rolling plateau about 3,200 ft. above the sea, which descends at angles of 45° and 50° into the Dead sea. The great chasm of Wady Mojebe, the Arnon of Scripture, divides them into two districts, of which the northern is called by the modern Arabs El-Belka, and extends as

far N. as the mountain of Gilead; while the southern is known as El-Kerak, and reaches southward to the wady of that name. The village of Kerak is supposed to stand upon the site of one of the ancient capitals of Moab, called in the Old Testament Kir-Haraseth (2 Kings iii. 25), Kir-Hareseth (Isa. xvi. 7), Kir-Hareseth (Isa. xvi. 11), Kir-Heres (Jer. xlviii. 31, 36), or Kir-Moab, an earlier one having been Ar, or Rabbath-Moab. It is built on the top of a steep hill surrounded by a deep and narrow valley. The land is now inhabited by a few scattered Arab tribes, but is covered with ruined villages and towns. According to the Biblical account, Moab was a child of Lot, and his descendants conquered before the time of the exodus a gigantic tribe called Emim, and took possession of their land; but they lost a portion of it to the Amorites, from whom it was taken by Moses. Balak, king of Moab, formed an alliance with the Midianites to resist the invading Hebrews, and sought to persuade Balaam the seer to curse them; but Balaam by divine direction blessed them. Subsequently Balaam seduced the Hebrews to join in the worship of Baal-peor. The Midianites were thereupon attacked by command of the Lord, and suffered great losses, but the Moabites were spared. Moses died and was buried in the land of Moab, in a ravine facing Beth-peor, the house of Baal-peor. During the time of the judges Eglon, king of Moab, united with the Ammonites and Amalekites and subjugated the Israelites; but after ruling and receiving tribute in Jericho for 18 years, he was killed by Ehud the Benjamite, and the Moabites were driven back to their own territory. Moab was conquered by Saul, and David made it a tributary state. After the division of the Hebrew state, the Moabites revolted against Ahab, king of Israel, whose son Jehoram tried in vain to reconquer their territory. They subsequently made various incursions into the Hebrew possessions, and appear in later times to have reoccupied the land between the Jabbok and Arnon, probably after the exile of the ten tribes, and they also assisted the Babylonians in their invasion of Palestine. But they, too, were subdued by the conquerors. Their name, like those of Ammon and Edom, was finally lost under that of the Arabians. Their licentious and bloody idolatry of Baal-peor and Chemosh made them an object of national detestation to the Hebrews, no less than their frequent hostilities, and they are often contemptuously spoken of in the prophets.—The discovery in 1868, at Dhiban in Moab, of a monument of black basaltic granite, with an inscription of 34 lines in Hebrew-Phœnician characters, attracted renewed attention to this country. The only European who saw the Moabite stone in a complete state was the Rev. Mr. Klein, of the Jerusalem mission society. The negotiations set on foot to obtain possession of it unfortunately resulted in quarrels among the Arab tribes, and led them to believe that the Turks would

make the stone a pretext for interfering in the government of the country; they therefore lighted a fire on it, and when it was hot threw water upon it, which broke it into three large and several small fragments. The three large pieces were obtained by Clermont-Ganneau, dragoman of the French embassy at Constantinople, who had also procured an imperfect paper impression of the text before the stone was broken. Some of the smaller fragments, obtained by Capt. Warren, came into the possession of the Palestine exploration society. Ganneau published a partially restored text, with a translation, in the *Revue archéologique* for March and June, 1870. The alphabet of the inscription is Hebræo-Phœnician, the oldest known form of Semitic. The language closely resembles Hebrew, and it is believed that the inscription dates from about 920 B. C. Owing chiefly to the fragmentary condition of the inscription, the decipherment cannot be regarded as finally established; but the labors of Ganneau, Neubauer, Nöldeke, Hitzig, Kämpf, Derenbourg, Haug, Schlottmann, Deutsch, Ginsburg, Levy, Harkavy, Wright, Lenormant, and others have doubtless determined its general contents. It appears that the stone was set up by Mesha or Mesa, king of Moab, son of Chemosh-Gad, who, speaking in the first person, records his wars with Omri, king of Israel, and his successors. Mesha fortified Baal-meon, made a successful attack on Kiriathaim, took Ashtaroth, and put all the inhabitants to death. He then assaulted Nebo, slew 7,000 men, and devoted the women to Ashtar-Chemosh, and the vessels of Jehovah to the same god. The king of Israel fortified Jahaz and attacked Mesha, but was defeated and lost the city, which was thereupon occupied by Moabites. Subsequently Mesha restored Korhah, rebuilt Aroer, Beth-bamoth, Bezer, Beth-gamul, Beth-diblathaim, and Beth-Baal-meon. In continuation Mesha narrates his successful wars against the Edomites. The fragments of the stone were purchased by the French government for 32,000 francs, and were transported to the Louvre in Paris. Recent travellers in Moab report that the Arabs are now afflicted with a mania for "written stones," and offer many for sale which are only covered with tribe marks, or at best fragmentary Nabathæan inscriptions.—See Clermont-Ganneau, *La stèle de Mesa* (Paris, 1870); Ward, in the "Bibliotheca Sacra" (Andover, October, 1870); Ginsburg, "The Moabite Stone" (London, 1870; 2d ed., revised and enlarged, 1871); Palmer, "The Desert of the Exodus" (London, 1872); and Tristram, "The Land of Moab" (London, 1873).

MOAWIYAH. I. The founder of the dynasty of the Ommyyade caliphs, born in Mecca about 610, died in Damascus in the spring of 680. He was the son of Abu Sofian, one of the chiefs at Mecca, and the great-grandson of Ommyya, a cousin of the grandfather of Mohammed. In 641 Omar appointed him governor of

Syria; and although he permitted the island of Cyprus, which fell into Saracen power about 648, to be recaptured by its people in 651, he subjugated and retained the island of Rhodes. On the assassination of the caliph Othman in 655, he refused to recognize Ali, his legitimate successor, but proclaimed himself caliph. After a long struggle, in which he often displayed tyranny and revolting cruelty, he succeeded in subjugating the whole Saracen empire, and placing its provinces under the control of governors friendly to him. His armies made large additions to his territory, conquering Bokhara and Samarcand on the north, and meeting with no important check until they attacked Constantinople, which was repeatedly besieged until in 678 Moawiyah was compelled to make terms of peace. He made the caliphate hereditary, though the measure excited great opposition, and compelled the recognition of Yezid, his son, as his future successor. II. Grandson of the preceding, born in Damascus in 660, died there in 686. He succeeded Yezid as caliph in the autumn of 683, but abdicated a few months later, declaring that the act of his grandfather in making the caliphate hereditary had been one of usurpation, in the results of which he would not share. He refused even to appoint a successor, but retired to a life of complete privacy. According to some historians, he died of the plague; according to others, he was poisoned. (See OMMIYADES.)

MOBERLY, George, an English bishop, born in 1803. He graduated at Oxford in 1825, and became successively fellow and tutor of Balliol college, public examiner, and select preacher before the university. In 1835 he was appointed head master of Winchester school. In 1868 he was the Bampton lecturer, and in 1869 he was made bishop of Salisbury. His numerous publications include "Introduction to Logic" (1838); "Sermons preached at Winchester College" (2 vols., 1844-'8); "Sayings of the Great Forty Days, with an Examination of Mr. Newman's Theory of Development" (1846; 4th ed., 1871); "Studies and Discipline of Public Schools" (1861); "The Administration of the Holy Spirit in the Body of Christ" (Bampton lectures, 1868); and "Brightstone Sermons" (1869).

MOBILE, the name of a river and bay in the southern part of Alabama, derived from that of a tribe of Indians (the Mauvilians or Mobilians) who inhabited the adjacent country at the time of its first settlement by Europeans. The river Mobile is formed by the confluence of the Alabama and Tombigbee. A few miles below this point it divides into two branches, the eastern one of which takes the name of Tensas, the western retaining that of Mobile. Before reuniting, both these streams separate into several other subdivisions, all of which meet in one common embouchure at the head of Mobile bay. The length of the Mobile river is about 50 m., and its general direction

is south. In the lower part of its course the banks are marshy and alluvial.—The bay of Mobile is about 30 m. in length from N. to S., with a general width of 10 or 12 m., except where it expands on the southeast into the subsidiary bay of Bon Secours, which extends some 8 or 10 m. further to the eastward. The entrance from the gulf of Mexico, between Mobile point on the east and Dauphine island on the west, is about 3 m. wide, and is commanded by Fort Morgan on Mobile point, and Fort Gaines on Dauphine island. The bay has another outlet on the southwest through Grant's pass, N. of Dauphine island, which communicates with Mississippi sound. Through this channel steamers and other vessels of light draught generally pass when plying between Mobile and New Orleans. The bar in front of the main entrance of the bay admits of the passage of vessels drawing 21 or 22 ft. The ordinary anchorage for ships is 4 or 5 m. within the entrance of the bay. The whole of the upper portion of the bay is shallow, and is supposed to be gradually filling up with sedimentary deposits from the rivers that flow into it. There is a lighthouse on Mobile point; another on Sand island, 3 m. S., immediately in front of the entrance; and one at the head of the bay, a little below the city of Mobile.

MOBILE, a S. W. county of Alabama, bounded E. by Mobile river and bay, S. by the gulf of Mexico, and W. by Mississippi; area, nearly 1,400 sq. m.; pop. in 1870, 49,311, of whom 21,107 were colored. The surface is generally uneven, except in that portion bordering on the bay and gulf, and the soil is sandy and poor, mainly covered with forests of pine. It has many streams of pure water, and, except on the low borders of the river, is very healthful. The county is traversed by the Mobile and Ohio, the New Orleans, Mobile, and Texas, and other railroads terminating at Mobile. A few miles S. of the mainland, in the gulf of Mexico, immediately W. of the entrance of Mobile bay, and forming a part of the county, is Dauphine island, the seat of a French settlement established by Bienville in 1702. It was originally called Massacre island, from the number of human bones found upon it. For several years it was at intervals the seat of government of the colony of Louisiana. The chief productions in 1870 were 61,350 bushels of Indian corn, 10,394 of Irish and 67,116 of sweet potatoes, 90,100 lbs. of rice, 7,532 of wool, 1,450 of honey, and 317 bales of cotton. There were on farms 451 horses, 492 mules and asses, 3,214 milch cows, 518 working oxen, 4,377 other cattle, 3,013 sheep, and 5,567 swine. There were 5 flour mills, 12 saw mills, 11 manufactories of tin, copper, &c., 14 of cigars, 2 of engines and boilers, and 5 of tar and turpentine. Capital, Mobile.

MOBILE, a port of entry and the capital of Mobile co., Alabama, the largest city and only seaport of the state, on the W. side of Mobile river, immediately above its entrance into

the bay of the same name, 30 m. from the gulf of Mexico, in lat. 30° 42' N., lon. 88° W., 180 m. S. W. of Montgomery, and 140 m. by rail E. by N. of New Orleans; pop. in 1820, 2,672; in 1830, 3,194; in 1840, 12,672; in 1850, 20,515; in 1860, 29,258; in 1870, 32,034; of whom 13,919 were colored and 4,239 foreigners. The number of families was 6,301; of dwellings, 5,738. The corporate limits extend 6 m. N. and S., and 2 or 3 m. W. from the river. The thickly inhabited part of the city extends for about a mile along the river, and nearly the same distance back to the westward. Its site is a sandy plain, rising as it recedes from the water. The streets are generally regular, well paved, and shaded. There are several fine public buildings, among which is a handsome market house with rooms for the municipal offices in the upper story. The custom house has also accommodations for the post office and United States courts. Among the other noticeable buildings are the theatre, Odd Fellows' and temperance halls, guard house and tower, medical college, and the Barton academy. Mobile is lighted with gas, and supplied with water of unusual purity and excellence, which is brought a little more than 5 m., from the foot of Spring hill. Six lines of street railroad traverse the city. The climate is generally healthful, except for occasional visitations of epidemic yellow fever. High and healthful hills within a few miles N. W. and S. W. afford permanent or summer residences. Four lines of railroad furnish communication with various points in the south, viz.: the Mobile and Ohio; Mobile and Montgomery; New Orleans, Mobile, and Texas; and Alabama Grand Trunk. The trade of Mobile is much hindered by the shallowness of its harbor. Vessels drawing more than 8 or 10 ft. are obliged to anchor in the bay, 25 m. or more from the city. In 1873 congress appropriated \$100,000 for the completion of improvements in the harbor, which it is hoped will enable vessels of 13 ft. draught to reach the wharves. The chief business is the receipt and shipment of cotton. The following table exhibits the number of bales received and shipped for six years:

YEARS.	RECEIPTS.	SHIPMENTS.		
		To foreign ports.	To domestic ports.	Total.
1868-'69.....	230,621	163,154	64,194	247,348
1869-'70.....	306,061	200,538	97,685	298,523
1870-'71.....	404,673	287,074	130,429	417,508
1871-'72.....	288,012	187,977	157,652	295,629
1872-'73.....	382,457	182,130	197,131	329,261
1873-'74.....	299,573	182,367	172,222	304,589

The trade in naval stores and lumber produced in the vicinity is increasing. In 1873 the shipments consisted of 15,000 to 20,000 barrels of spirits of turpentine, 75,000 to 100,000 of rosin, and 1,000 of tar, together valued at \$750,000, and 2,627,549 ft. of lumber. The importation of coffee is also increasing, and in 1872-'3 amounted to 58,956 bags. The

trade with foreign ports since 1867 (years ending June 30) is shown in the following table :

YEARS.	Exports.	Imports.
1867.....	\$22,101,601	\$385,580
1868.....	22,611,973	566,225
1869.....	20,541,450	511,297
1870.....	22,422,681	1,447,516
1871.....	21,874,708	1,811,614
1872.....	18,954,660	1,761,657
1873.....	12,249,866	1,097,164
1874.....	10,282,734	886,411

Of the exports in 1874, \$9,384,820 consisted of cotton. The entrances from foreign ports during the year ending June 30, 1874, numbered 53, with an aggregate tonnage of 33,667; clearances to foreign ports 41, tonnage 22,509. The coastwise entrances were 135, tonnage 48,373; coastwise clearances, 123, tonnage 45,115. In 1873 80 sailing vessels of 7,586 tons, 30 steamers of 7,316 tons, and 22 barges of 1,475 tons, belonged to the port. Steamers run regularly to Montgomery and other points on the Alabama, Tombigbee, and Black Warrior rivers. The principal manufactures are two of sash, doors, and blinds, one of paper, several of carriages and cabinet ware, two cooperages, a brewery, three saw mills, and four foundries and machine shops. There are two national banks, with a joint capital of \$800,000; two state banks, with \$1,000,000 capital; two savings banks, and nine insurance companies.—Mobile is divided into eight wards, and is governed by a mayor, with a board of councilmen of one member and a board of aldermen of three members from each ward. It has a municipal court and an efficient fire department and police force. The United States courts for the southern district of Alabama are held here. The principal charitable institutions are four orphan asylums, the city hospital, the United States marine hospital, and the Providence infirmary. The medical college of Alabama was established here in 1859, and in 1873-'4 had 9 professors and 85 students. The number of public schools in the entire county in 1873-'4 was 71 (42 white and 29 colored), with an attendance of about 4,500. The boys' and girls' high schools and a number of the lower grades are held in the Barton academy in the city. There are seven Roman Catholic schools and academies, a Hebrew school, and a number of private schools and academies. Two daily newspapers are published. There are 30 churches, viz.: 5 Baptist (2 colored), 4 Episcopal, 1 German Lutheran, 1 Jewish, 10 Methodist (6 colored), 3 Presbyterian, and 6 Roman Catholic. In the immediate vicinity of Mobile are the college of St. Joseph at Spring Hill, under direction of the Jesuits, and the academy of the Visitation, Summerville, conducted by the sisters of the Visitation.—Mobile was the original seat of French colonization in the southwest, and for many years the capital of the colony of Louisiana. In 1702 Le Moyne de Bienville trans-

ferred the principal seat of the colony from Biloxi to a point on the river Mobile supposed to be about 20 m. above the present city, where he established a fort which he called St. Louis de la Mobile. At the same time he built a fort and warehouse on Isle Dauphine, at the entrance of Mobile bay. Many of the first settlers were Canadians. In 1705 an epidemic, supposed to be the first recorded visitation of yellow fever, carried off 35 persons. The year 1706 was noted for the "petticoat insurrection," a threatened rebellion of the women, in consequence of dissatisfaction with the diet of Indian corn. The colony frequently suffered from famine, as well as from the attacks of Indians, although relieved by occasional supplies from the mother country. In 1711 the settlement was nearly destroyed by a hurricane and flood, in consequence of which it was removed to its present situation. In 1723 the seat of the colonial government was transferred to New Orleans. In 1763, by the treaty of Paris, Mobile, with all that portion of Louisiana lying E. of the Mississippi and N. of Bayou Iberville, Lakes Maurepas and Pontchartrain, passed into the possession of Great Britain. In 1780 the fort, the name of which had been changed to Fort Condé, and subsequently by the British to Fort Charlotte, was captured by the Spanish general Don Galvez, and in 1783 its occupancy was confirmed to Spain by the cession to that power of all the British possessions on the gulf of Mexico. On April 13, 1813, the Spanish-commandant, Cayetano Perez, surrendered the fort and town to Gen. Wilkinson. At that period the population, which in 1785 had amounted to 746, was estimated at only 500 (exclusive of the garrison), half of whom were blacks. In December, 1819, Mobile was incorporated as a city. On Jan. 4, 1861, the state authorities of Alabama took possession of the United States arsenal at Mount Vernon, 35 m. from Mobile, and soon afterward garrisoned Forts Morgan and Gaines at the entrance of the bay, though the state did not secede until the 11th. Mobile was not seriously attacked until the summer of 1864, when the city had been encompassed with three lines of defensive works, while ten batteries commanded the channel below the city, which was also obstructed with rows of piles, and a small confederate fleet, carrying 22 guns and 470 men, was anchored under the guns of Fort Morgan. On Aug. 5 Admiral Farragut, with 18 vessels, carrying 199 guns and 2,700 men, entered the bay under the fire of the two forts, which he returned while passing, but without stopping. He was assisted by 1,500 soldiers, under Gen. Gordon Granger, who were intrenched on Dauphine island, within half a mile of Fort Gaines. Farragut's leading vessel, the Tecumseh, struck a torpedo and instantly sank, carrying down her captain and 112 men. The flag ship Hartford, with the admiral in the rigging, then took the lead, and after an engagement lasting an hour passed the forts and steamed into the bay, followed by

the remainder of the fleet. They at once encountered the confederate fleet, which after a sharp conflict was destroyed or captured; the most formidable vessel, the ram Tennessee, did not surrender until a 15-inch shot had penetrated her armor, her steering apparatus had been disabled, and the commander of the fleet, Admiral Buchanan, seriously wounded. The Union loss in this engagement was 52 killed, 170 wounded, and 113 drowned. The confederate loss in the fleet was 10 killed and 19 wounded; in the two forts, 8 killed and 21 wounded. Fort Gaines, with 800 men, surrendered on the 8th. Fort Morgan was at once besieged; it was bombarded and almost entirely destroyed on the 22d, and surrendered on the morning of the 23d. Late in March, 1865, Spanish Fort and Blakely, fortified places on the eastern shore of the bay and Tensas river, were invested by a force of 45,000 men, under Gens. Granger, Steele, and A. J. Smith. These forts were carried by assault on the 8th and 9th of April, 4,000 prisoners being captured, while heavy losses were sustained by the besiegers. Mobile being thus exposed to attack from the river, it was evacuated by the confederates on the 11th, and occupied by the Union troops next day.

MOBILE POINT, the apex of a long, low, narrow, sandy peninsula between the gulf of Mexico on the south and Bon Secours bay and Navy cove on the north. The point is the eastern limit of the entrance into Mobile bay. It is the site of Fort Morgan, built in the place of Fort Bowyer, famous for the repulse of an attack by the British, Sept. 14, 1814. The fort, which was very imperfectly constructed, was commanded by Major Lawrence, with a garrison of only 130, including men and officers, and 20 pieces of artillery. It was attacked by a squadron of two sloops of war and two brigs, assisted by 600 Indians on land, with whom were associated 130 marines from the ships. The attack continued for three hours, when the enemy were repulsed, with the loss of the *Hermes*, Commodore Percy's flag ship, which ran aground and was burned, and 232 men killed and wounded. Eight of the garrison were killed. After the battle of New Orleans, Fort Bowyer was again invested by the whole British force, and Lawrence surrendered, Feb. 12, 1815. (See **MOBILE**.)

MÖBIUS. **I. August Ferdinand**, a German mathematician, born at Schulpforta, near Naumburg, Nov. 17, 1790, died in Leipsic, Sept. 26, 1868. He graduated at the university of Leipsic in 1815, and was a professor there for 50 years. He remodelled the observatory, and in his *Der barycentrische Calcul, ein neues Hilfsmittel zur analytischen Behandlung der Geometrie* (Leipsic, 1827), established the new principle of the affinities of figures. His *Lehrbuch der Statik* (2 vols., 1837) gives a comprehensive account of the intimate connection between statics and geometry. His most celebrated astronomical works are *Die Elemente der*

Mechanik des Himmels (1843), and *Die Hauptsätze der Astronomie* (4th ed., 1860). **II. Theodor**, a German philologist, son of the preceding, born in Leipsic, June 22, 1821. He graduated at Leipsic in 1852, and in 1859 became professor of Scandinavian languages and literature there. In 1865 he accepted a similar position at Kiel. He has edited many old Norse works. **III. Paul Heinrich August**, a German author, brother of the preceding, born in Leipsic, May 31, 1825. He studied theology and philosophy, and became a teacher in Leipsic and a preacher at the church of the university. From 1853 to 1865 he was director of an educational institution for booksellers, and subsequently of one of the principal schools in Leipsic. His miscellaneous writings include stories, poetry, and a tragedy, and *Katechismus der deutschen Literaturgeschichte* (Leipsic, 1857; 4th ed., 1871).

MOCANNA, or **Mokanna**. See **ATHA BEN HAKEM**.

MOCHA, or **Mokha**, a seaport of Arabia, formerly the capital of the province of Yemen, on the Red sea, at the head of a little bay near the strait of Bab-el-Mandeb, 130 m. N. W. of Aden; pop. about 7,000. The roadstead is protected only by two narrow spits of sand, on one of which is a castellated fort and on the other an insignificant battery. Vessels drawing 12 ft. of water can enter it. The houses are generally of coral rock or sun-baked brick whitewashed, but in the suburbs they are circular huts built of date-tree matting, with conical roofs. There are three suburbs, one occupied by Abyssinian mariners and Mohammedan traders, one by Arab laborers, and one by Jews. The chief public edifices are the mosques, one of which is very large. Mocha is celebrated for its coffee, the annual export of which, though much less than in former times, was recently still about 10,000 tons. Other articles of trade are dates, gums, balm, ivory, and senna. The growth of Hodeida and Aden has injured the prosperity of Mocha, and its commerce has decreased greatly in late years.

MOCHUANA. See **BECHUANA**.

MOCKING BIRD, an American passerine bird, of the subfamily *mimina*, and genus *mimus* (Boie). The subfamily includes the catbird, brown thrush, and nearly 20 other mockers, arranged by Gray under the single genus *mimus*, but subdivided by Cabanis and others into nearly as many genera as species. The restricted genus *mimus* has the bill shorter than the head, slightly curved from the base, and notched at the tip; the gape furnished with bristles; lower jaw with no longitudinal ridges; wings moderate and rounded, with the first quill very short, the second longer, and from the third to the seventh nearly equal and longest; tail long and graduated; tarsi longer than the middle toe, robust, and covered in front with broad scales; toes long, with sharp curved claws. The size is large, and the general appearance thrush-like. The species of this genus

are found in North and South America, the West Indies, and the Galápagos islands; they are shy, active, and migratory, feeding on insects, berries, and worms; the song is highly pleasing, and the powers of imitation are very great.



Mocking Bird (*Mimus polyglottus*).

The common mocking bird (*M. polyglottus*, Boie) is about 9½ in. long, with an extent of wings of 13½; the bill and legs are black; the general color above is ashy brown, a little the darkest in the centre; the under parts white, with a brownish tinge except on the chin, and a shade of ash across the breast; a pale superciliary stripe; wings and tail nearly black; lesser wing coverts like the back, the middle and greater tipped with white, forming two bands; outer tail feather white, the second mostly so, the third with a white spot on the end, and the rest, except the middle, slightly tipped with white. It is found in the southern United States, from the Atlantic to the high central plains, replaced by the *M. montanus* (Bonap.) to the westward. The song of the mocking bird, in its mellowness, modulations and gradations, compass, and brilliancy of execution, is unrivalled; it can adapt its tongue to any note; it deceives the sportsman, cheats and terrifies birds, whistles to the dog, and imitates almost every sound, animate or inanimate; it sings charmingly at night, commencing as soon as the moon rises; its finest song is during the breeding season. It delights to build in gardens near houses; the eggs are usually five, light green with brown spots and blotches. They begin to pair toward the end of March, and three broods are generally raised between that and the last of September. They remain in the gulf states all the year; some go to the north in the spring, returning in October; they are most plentiful near the seashore, in sandy districts scantily furnished with trees; in winter they live principally about the farm houses and plantations. Their motions on the ground are light and elegant, accompanied by

frequent openings of the wings and tail; the flight is short and jerking. The call note is very mournful, like that of the *M. rufus* (Boie), the French mocking bird so called. Its courage is sufficient to defend it against most birds of prey. It is easily reared by hand from the nest, and becomes very familiar and affectionate in confinement; its vocal powers, though great in captivity, are very much greater in its native haunts; it is long-lived, and a good singer always commands a high price. The female differs little from the male, but the plumage is somewhat duller. The *M. Carolinensis* (Gray) has been described under CATBIRD. Other species are described in South America, and on the Pacific coast of North America, all possessing remarkable powers of song.

MODENA. I. A former duchy of northern Italy, bordering on Mantua, Ferrara, Bologna, Lucca, Genoa, Parma, and the Mediterranean; area, about 2,300 sq. m. It comprised Modena proper, Reggio, Guastalla, Frignano, Garfagnana, Massa-Carrara, and Lunigiana. The last three divisions lie S. of the Apennines, the main ridge of which crosses the southern portion of the territory, sending off extensive spurs. The highest summit is Monte Cimone, 7,000 ft. The territory of Modena extended from the Po to the Mediterranean, the coast being small and destitute of harbors. About one third of it, watered by the Panaro, forms part of the great and fertile plain of Lombardy. The principal river is the Secchia, which after a winding course of 100 m. joins the Po opposite the mouth of the Mincio. The principal productions are wheat, maize, hemp, flax, rice, pulse, olives, wine, and silk. Agriculture is backward, but improving. Few of the farms exceed 60 acres; dairy pasture prevails to some extent in the valley of Garfagnana; a few families own the large flocks of Apennine sheep. The vine is most extensively cultivated near Reggio and the city of Modena. The mountains abound with oak, pine, and chestnut. Iron and other minerals are found, and the marble of Carrara is a lucrative article of export. The territory now forms three provinces of the kingdom of Italy: Modena, Reggio, and Massa e Carrara. Its history is given in connection with that of the city. II. A province of the kingdom of Italy, embracing of the former duchy of Modena the provinces of Modena and Frignano; area, 966 sq. m.; pop. in 1872, 273,231. III. A city (anc. *Mutina*), capital of the province, beautifully situated in a plain between the Panaro and the Secchia, 23 m. N. W. of Bologna; pop. in 1872, 56,690. It has a citadel, is surrounded with ramparts, and is divided into the new and old city, a part of the Æmilian way intersecting it. The Gothic *duomo* or cathedral contains interesting tombs, one of which, designed by Giulio Romano, is celebrated on account of its square marble tower, one of the highest in Italy. Famous among the numerous churches, on account of their colos-

sal marbles, are those of San Vincenzo, Sant' Agostino, and San Francesco. The former ducal (now royal) palace in the great square is a fine edifice, and contains a large collection of paintings by Guido Reni, the Carracci, Andrea del Sarto, Carlo Dolce, and Guercino, Pomarancio's "Crucifixion," and other remarkable works. It has a recumbent Cleopatra by Canova, and the ceiling of the gallery is painted in fresco by Francesconi. The library, brought from Ferrara by Cesare d'Este, and hence known as the *biblioteca Estense*, has about 100,000 volumes, and is rich in manuscripts, coins, and medals. The other public buildings of Modena are the university, one of the most famous in Italy, the museo Lapidario, the theatre, the post office, and the archiepiscopal palace. There are many educational institutions and an academy of sciences and fine

arts. Modena is the seat of an archbishop. The university in 1873 had 42 professors and 315 students.—The ancient Mutina is supposed to have been of Etruscan origin. According to Livy, the territory in which it was situated had been taken from the Boians, and after the final defeat of the latter it was made a Roman colony (183 B. C.). It was a strong place in the time of Sulla, and subsequently became celebrated by the siege which it sustained and the battles fought between Decimus Brutus and Mark Antony, a campaign known as the *bellum Mutinense* (43). Afterward it suffered much from the general calamities of the empire, and toward the end of the 4th century, according to St. Ambrose, it was in a deplorable condition. In the middle of the 5th century it endured the still more terrible ravages of Attila. Under the Lombard kings Mutina



Modena.

became the frontier city of their dominions toward the exarchate. At the close of the 6th century it was taken by the Greek emperor Maurice. Subsequently it was restored to the Lombard kingdom, but according to Muratori nearly the whole city was reduced for several centuries to a morass, chiefly owing to inundations. It was governed by Frankish counts for some time after the 9th century, in the 11th by its bishops, and at its close by the countess Matilda of Tuscany. Subsequently it formed part of the Lombard league; and after suffering from the feuds which distracted for a long period the cities of northern Italy, it passed along with Ferrara into the possession of the Torrelli family, and at the end of the 13th century the house of Este became the rulers of the city and its territory. The titles of duke of Modena and Reggio and count of Rovigo were conferred upon Borso of Este in

1452 by the emperor Frederick III. of Germany, and that of duke of Ferrara by Pope Paul II. in 1471. (See ESSE.) The duchies of Modena and Reggio remained in the Este family till 1797, when Napoleon took them from Ercole III. (who died in 1803), and annexed them to the Cisalpine republic. His daughter Maria Beatrice married the Austrian archduke Ferdinand, and their son Francis IV., who inherited Massa-Carrara, was reinstated as duke of Modena in 1814, and was succeeded in 1846 by his son Francis V., whose elder sister is the wife of the count de Chambord, and his younger sister of the younger son of Don Carlos, the first Spanish pretender of that name, and mother of the present pretender. (See CARLOS.) Even more autocratic than his predecessors, he was obliged to invoke the assistance of Austria at the end of 1847 to maintain his authority, and he fled in March, 1848, while

the Modenese established a provisional government. After the defeat of the Sardinian army by Radetzky he returned to his capital, Aug. 10, fled again March 14, 1849, returned in May, and feigned to be bent on liberal reforms. But he soon relapsed into absolutism and reinstated the Jesuits (June, 1850). In 1859, after the battle of Magenta, he finally left Modena, though the Franco-Austrian treaty of Villafranca confirmed him in his possessions. His dynasty was deposed by the Modenese national assembly, Aug. 19; and by a decree of March 18, 1860, Modena became part of the department of Emilia, in the dominions of Victor Emanuel.

MODICA, a town of Sicily, in the province and 30 m. S. W. of the city of Syracuse, in a narrow valley surrounded by high rocks; pop. in 1872, 33,169. It has a castle, a technical school, a gymnasium, a beautiful cathedral, and several other notable churches. The inhabitants are mostly engaged in agriculture and in the breeding of horses and mules. A brisk trade is carried on in grain, oil, wine, cheese, and other products. About 4 m. from Modica, in the midst of a stony desert, is the valley of Ipsica, famous for its dwellings excavated in the rocks, supposed to be the work of the original inhabitants of Sicily.

MODLIN. See NOVOGEORGIEVSK.

MODOCS, a tribe of American Indians, originally part of the Klamath nation, but in recent times hostile to them. The name Modoc was given to them by the Shastecas, and means enemies. Their original territory was a district about 100 by 40 m. on the S. shore of Klamath lake, California. They were dark-colored, with a heavy drowsy face and dull yellowish eye. Their houses were pits roofed with a conical structure of wooden slabs, covered with earth. Both sexes were decently clothed in skins. They contended with the Shastecas and the Klamaths, and traded in the slaves they captured in war. They recognized a deity called Komoose. As early as 1847 and 1849 they are charged with having cut off more than 50 whites. The Indians on Clear lake chastised by Capt. Nathaniel Lyon in 1850 were apparently of this tribe. After another massacre of whites in 1852 Ben Wright invited the Modocs to a peaceful feast in 1855, and killed 41 out of 46 who came. This act the Modocs never forgave. A campaign against them in 1856 under Gen. Crosby cut off many, but the war was kept up till 1864, when a treaty was made, by which they ceded their lands and agreed to go on a reservation. This treaty was not ratified by the President's proclamation till Feb. 17, 1870, or the reservation officially set apart till March 14, 1871. Meanwhile the Modocs had been induced to go upon the Klamath reservation, but it was a part of the country where they could not live; their own provisions were destroyed, they were cheated out of government allowances, and the Klamaths harassed them. Some were then

moved to Yainax reservation, but Klamaths were put with them, and the trouble continued. Two Modoc bands left the reservation. The turbulent band of Captain Jack (Krentpoos), who had set himself up against Schonchin, the hereditary chief, after suffering greatly in the winter, returned in February, 1868, to their old home on Lost river, while the quiet and inoffensive band settled on Hot creek near the whites. Loud complaints were made against Captain Jack's band, and the commissioner of Indian affairs, on April 11, 1872, ordered Superintendent Odeneal to remove them from Lost river to the reservation. On their refusal to go, troops from Fort Klamath moved on Captain Jack's camp, Nov. 29, 1872, and some Oregon citizens on another camp on the opposite side of the river. Fighting ensued at both camps. The whites withdrew with loss, and the Modocs, retreating united, massacred some peaceful settlers on the way, and reached the Lava Beds, a volcanic region which served as a natural fortification. Maj. Gen. Wheaton entered this tract, Jan. 17, 1873, but could not penetrate within three miles of the Modoc stronghold, and after losing 11 killed and 21 wounded drew off. Gen. Gillem then took command, but with no greater success. Meanwhile the government appointed commissioners to inquire into the causes of discontent. A conference, April 11, 1873, was broken up by the Modocs attacking the commissioners, killing Gen. Canby and Dr. Thomas, and wounding Mr. Meacham, another of the commissioners. Active operations were resumed, and the Modocs, after a long and stubborn resistance, finally surrendered to Gen. J. C. Davis, about June 1. Captain Jack, Schonchin, jr., and two other Modocs were tried by a military commission and executed at Fort Klamath, Oct. 3. The rest of those captured were, by order of the secretary of war and the Indian commissioner (Nov. 4), placed on the Quapaw reservation, in the Indian territory. This band numbered 148; the number of those left at the Klamath agency who took no part in the war was about 100.

MÆRIS, a lake of Egypt, near the ancient Crocodilopolis, now Medinet-el-Fayoom. Herodotus says: "Wonderful as is the labyrinth, the work called the lake of Mæris, which is close by the labyrinth, is yet more astonishing. The measure of its circumference is 3,600 furlongs, which is equal to the entire length of Egypt along the seacoast. The lake stretches in its longest direction from north to south, and in its deepest parts is of the depth of 50 fathoms. It is manifestly an artificial excavation, for nearly in the centre stand two pyramids, rising to the height of 300 ft. above the surface of the water, and extending as far beneath, each crowned with a colossal statue sitting upon a throne. The water of the lake does not come out of the ground, which is here excessively dry, but is introduced by a canal from the Nile. The current sets for six months into

the lake from the river, and for the next six months into the river from the lake." The same historian ascribes the formation of this lake to a king Mœris who lived about 1350 B. C., and who is identified by modern Egyptologists with Amen-hotep (Amenophis) III., the Memnon of the later Greeks and Romans. But he confounds the natural lake Birket-el-Keroon with the artificial lake Mœris. (See BIRKET-EL-KEROON.) During the annual inundation of the Nile the two lakes would appear as one. Mœris in reality was an extensive reservoir secured by dams and communicating by canals with all parts of Fayoom, to supply which with water was the object of its construction.

MÆSIA (in Greek, Mysia), an ancient country of eastern Europe, bounded N. by the Savus (Save) and Ister (Danube), E. by the Euxine, S. by the Hæmus (Balkan) and Scardus ranges, and W. by the Drinus river (Drin). It was divided by the Romans, who conquered it in the early period of the empire, into Mæsia Inferior or E. Mæsia, the present Bulgaria, and Mæsia Superior or W. Mæsia, the present Servia, divided by the little river Ciabrus (Tzibritza). The original inhabitants were chiefly Thracians, among them the Triballi. Under Aurelian the Dacian colonies were removed there, when the middle part of the province also received the name of Dacia Aureliani. It was occupied by the Goths in the 4th century, who were called Mæso-Goths, and who surrendered the territory to the emperor Theodosius I. Slavs settled here in the 6th and 7th centuries.

MOFFAT, Robert, a Scottish missionary, born at Inverkeithing, Fifeshire, in 1795. He was reared in the Secession church, but his religious associations from 1811 till 1816 were largely with the Methodists of England, where he then

lived. He was a gardener, but devoted his leisure hours to study, and in 1815 offered himself as a missionary. He was originally destined to accompany Williams to the South sea, but was finally sent to South Africa. He sailed in 1817, and immediately on his arrival at Cape Town went to Namaqualand, where he entered upon his labors at the kraal of Africaner, a chief whose name had long been a terror to the neighboring districts, but who had lately become an enthusiastic convert to Christianity. Here Moffat labored for three or four years with great success. But the situation being unsuitable for a principal mission station, he set out in search of a better locality, and labored successively with much promise in the countries to the north and northeast of Cape Colony, and in every place guided the people in the arts of civilized life. He often made tours among barbarous warlike tribes. His remarkable adventures in these journeys are described in his "Missionary Labors and Scenes in Southern Africa" (8vo, London, 1842), which he wrote and published during a visit of several years to Britain, rendered necessary by the state of his health. During his stay there, he also carried through the press a version of the New Testament and the Psalms in the Bechuana language. He returned to Africa in 1842, and continued there until recently, when he went back to London. He has compiled a "Seeuana Hymn Book" (London, 1843), and his "Farewell Services" were edited by Dr. Campbell, and published in 1843. Dr. Livingstone was Moffat's son-in-law.

MOGADORE, or **Sulrah**, a fortified seaport town of Morocco, on the Atlantic, 130 m. W. by S. of the city of Morocco; pop. about 20,000, many of whom are Jews. The town stands



Mogadore.

on an eminence, opposite an island of the same name, and is surrounded by a low sandy flat, which at high water is overflowed by the sea. It consists of two parts, one called the cita-

del, inhabited by Moors, and the other called Mellah, by Jews. The town is well supplied with water by an aqueduct. The houses are generally large and flat-roofed. Some of the

mosques are fine. The chief exports are wool, gum, wax, hides, almonds, honey, ostrich feathers, ivory, and gold dust. The harbor is formed by an island S. of the town, and is the best on the W. coast of Morocco. Mogadore was founded in 1760 by the emperor Sidi Mohammed, on the site of an old Portuguese fort. It was bombarded by the French under the prince de Joinville, Aug. 15, 1844. It suffered also during the war with Spain (1859-'60).

MOGHILEV, or **Mogilev**. See **MOHILEV**.

MOGILA, or **Mogilas**, **Peter**, a Russian author, born in Moldavia about 1597, died Dec. 31, 1646. He studied at several of the European high schools, but stayed longest at the university of Paris. He served in the Polish army with distinction, and in 1625 entered a monastery at Kiev. In 1629 he became archimandrite, and in 1633 metropolitan of Kiev, Galicia, and Little Russia. He was the first to introduce in the study of theology at Kiev the developments which it had acquired in the European universities. He improved the courses of study in every particular, obtained permission to erect a printing press, invited many learned men to the academy, settled upon them sources of revenue which had formerly gone to the metropolitan, and gave them his own valuable collection of books. To confirm the views and feelings of the oriental church in opposition to the encroachments of Roman and Protestant elements, Mogila wrote a "Confession of Faith," which was examined and approved by two councils, and, being indorsed by the four oecumenical patriarchs, and by the Russian patriarchs Joachim and Adrian, became the first symbolic book of the eastern church, and has continued to be the standard book in theology. Mogila published also a "Catechism" (Kiev, 1645), and some pamphlets. Many of his dramas were acted by his pupils at Kiev, and that on the nativity of Christ was for a long time very popular.

MOGULS, a corruption of the term **Mongols**, used in Hindostan to designate the Tartars who repeatedly invaded that country in the middle ages, and who made themselves masters of Delhi in 1526, and placed their leader Baber, a descendant of Tamerlane, on the throne. His successors are known as the **Mogul** emperors, of whom the most eminent were Akbar (1556-1605), Jehangheer (1605-'27), and Aurungzebe (1658-1707). During these reigns the **Mogul** empire comprised nearly the whole of Hindostan, and in Europe the emperor was called the Great **Mogul**. His authority gradually dwindled till it became merely nominal; the English supremacy was formally established in 1803, and in 1827 the Great **Mogul** became a titled pensioner of the British crown. The last of the **Mogul** dynasty, Mohammed Bahadur, being implicated in the sepoy mutiny, was deprived of his title and transported in December, 1858.

MOHÁCS, a town of S. Hungary, in the county of Baranya, on the W. arm of the Danube,

110 m. S. by W. of Pesth; pop. in 1870, 12,140. It is an episcopal see, and contains the bishop's palace, a Roman Catholic, a Greek, and a Protestant church, a monastery, an ancient castle, a gymnasium, and the county buildings. It is a station of the Danube steamers, and the depot of considerable commerce in coal, wood, wine, and agricultural produce, most of which goes to Vienna. Five annual fairs are held here, the principal one being a cattle fair. A great battle was fought here, Aug. 29, 1526, between an army of 200,000 Turks under Solyman the Magnificent and one of 30,000 under the Hungarian king Louis II., which resulted in the defeat of the latter, 22,000 of whom, including seven prelates and 28 chief magnates, were slain, and the king perished on the retreat. A second battle of Mohács, Aug. 12, 1687, resulted in an almost equally decisive defeat of the Turks by the Austro-Hungarian army under Charles of Lorraine; the Turks lost 20,000 men, the Christians 600.

MOHAMMED, or **Mahomet** (Arab., the Praised, or, according to E. Deutsch and Sprenger, the Desired or Promised, in allusion to Haggai ii. 7), the founder of the Mussulman religion, born in Mecca, according to some, Nov. 10, 570, according to others April 20, 571, died in Medina, June 8, 632. His Mohammedan biographers say that his birth was accompanied by miracles; the sacred fires of the Parsees were extinguished, the palace of the Persian king was shaken by an earthquake, the lake Sawa dried up, and many other prodigies took place. His family (Hashem) belonged to the distinguished tribe of Koreish, were hereditary guardians of the Caaba, and were said to be directly descended from Abraham by his son Ishmael; nevertheless his parents were poor. His father Abdallah, a merchant, died two months after his birth. The orphan was confided for a little more than two years to the care of a Bedouin nurse, Halima, who returned him to his mother in consequence of spasmodic fits which she attributed to evil spirits. At the age of six years he lost his mother, and was carried by a female slave to his grandfather Abd-el-Mottalib. Two years later he lost also his grandfather, and was then adopted by his uncle Abu Taleb, who held the key of the Caaba. With him young Mohammed (in his 9th or 12th year) made journeys through Syria and other countries, and became acquainted with a Christian (probably Nestorian) monk, called by some Bahira, by others Serjis, who predicted his future greatness. Another uncle, Zobair, he accompanied on a mercantile trip to southern Arabia, and four years afterward was with him in a campaign against the Beni Kinana. In his 25th year he was a shepherd near Mecca, and then joined for a short time the business of a linen trader named Saib, commerce being at that time almost the sole occupation of the higher classes in Mecca. At Hajasha, a market six days' journey S. of Mecca, Mohammed, compelled by poverty,

entered the service of a rich widow named Khadijah. Several business journeys which he made for her through Syria and Arabia so pleased her that she determined to marry him. According to the common tradition Khadijah was then 40, and Mohammed a little over 25 years old. After his marriage Mohammed gave up business, and for ten years was chiefly occupied with his family, having by Khadijah four daughters and two sons; both sons died young. From his 35th to his 40th year Mohammed frequently resorted to a solitary cave of Mt. Hara, to give himself up entirely to religious contemplation. There, amid spasmodic convulsions, he had his first vision, in which the angel Gabriel appeared and commanded him to recite what he (the angel) said. Mohammed was troubled as to the nature of his mission, whether it came from an angel or from an evil spirit. His wife consulted her cousin Waraka, "who was old and blind" and knew the scriptures of the "Jews and Christians," and he assured her, and afterward Mohammed himself, that "God had chosen him to be the prophet of this people." The revelations continued henceforth without interruption to the end of his life, and were dictated by Mohammed to several secretaries, committed by his adherents to memory, and after his death collected and written down. (See KORAN.) His wife was his first convert. During the first three years of his mission only the relatives and friends of Mohammed acknowledged him as a prophet, and the whole number of believers (*Moslem* or Moslems) amounted scarcely to 40, among whom were Abubekr and Ali. In the fourth or fifth year of his mission he came forward publicly in compliance with a special message, and proclaimed himself a prophet, but met only with imprecations and ill treatment. To protect him from attempts on his life, he was removed by his uncle Abu Taleb to a fortified castle outside of Mecca, where he remained three years. The Koreishites outlawed him and his disciples. When the interdict, after the expiration of three years, was removed, Mohammed returned to Mecca; and soon after, in the tenth year of his mission, he lost his uncle and protector Abu Taleb, who never acknowledged the mission of his nephew. Three days later he lost his wife Khadijah, during whose lifetime he had not taken other wives; after her death he soon married several, nine of whom survived him. Mohammed was again expelled from Mecca, and also from Tayef; but soon he reentered Mecca, greatly strengthened by his celebrated journey to heaven. His relation of the journey, which he called a dream, increased the wrath of his enemies, and caused the defection of some of his adherents. Some pilgrims from Yathreb, belonging to the tribe of Khazraj, were converted in 621, and on their return propagated his doctrines at home. In 622, 73 Moslems from Yathreb appeared at Mecca, and concluded with Mohammed a treaty offensive and defensive. In September of the same year,

in consequence of a new plot against his life, he fled to Yathreb, whither the Meccan believers, 45 in number, had partly preceded him, and partly soon followed him. On his way he also converted the tribe Beni Sahn. At Yathreb the new faith was established on a firm basis, and not without reason therefore the era of the Moslems begins with the flight of the prophet, the Hegira. (See HEGIRA.) Moreover, the name of Yathreb was changed into Medinet en-Nebi, "the city of the prophet" (Medina). Mohammed at first endeavored to convert the numerous Jews in Arabia, and made them important concessions; but these he rescinded on their declining to adopt his religion, and became their irreconcilable enemy. During the first year of the Hegira he built a mosque at Medina, instituted religious rites, and proclaimed war against the unbelievers. He commenced this sacred war with attacks on the caravans of pilgrims, which led in 623 to an engagement at Bedr between 314 Moslems and 600 Meccans under Abu Sofian, the chief of Mecca, in which the Moslems were victors. In the following years Mohammed suffered many reverses; he was defeated by the Koreishites in the battle of Mt. Ohod (625), and besieged in Medina (627); and even among his followers a party was stirred up against him. To restore his reputation and influence, he determined to organize a large pilgrimage to Mecca, but was impelled by a dream to start with only 700 men. The Meccans prevented him from entering the city, but at last concluded a truce for ten years, with the promise that the following year he would be admitted to the city as a pilgrim. To divert the discontent of his fellow pilgrims, he led them against several Jewish tribes, and on the whole was successful; yet a Jewess, Zainab, to avenge the death of her relatives, prepared for him a poisoned lamb, which, as he believed, destroyed his health. At this time the plans of Mohammed for the spreading of his religion assumed a wider scope. He sent written demands to the Persian king Chosroes II., the Abyssinian king, the emperor Heraclius, the governor of Egypt, and the chiefs of several Arab tribes. Some received his ambassadors courteously, but Chosroes tore up Mohammed's letter, while the people of Muta killed his envoy. In a war undertaken to avenge this murder the troops of Mohammed fought a desperate battle at Muta, in which Khaled, a new convert, highly distinguished himself, and was consequently termed by Mohammed "the Sword of God." He punished the Meccans, who had broken faith with him, and compelled them to acknowledge him as a sovereign and a prophet. The possession of Mecca decided the victory of the new religion in Arabia, and notwithstanding temporary reverses, the subjection of a majority of the inhabitants of Arabia to Mohammed's rule and religion became complete. He returned to Medina, where in the ninth year of the Hegira he received deputa-

tions from various tribes who announced their submission. He proclaimed a holy war against the Byzantine empire, which proved a complete failure, and he was obliged to return to Medina amid the reproaches of the soldiers. In the following year Mohammed made his last pilgrimage to Mecca at the head of at least 40,000 pilgrims. The rites of this pilgrimage have ever since been regarded as the standard rule for pilgrimages. Three months after his return to Medina he was taken seriously ill. He called his wives together, and requested that he might be allowed to remain in the house of Ayesha, his favorite, which adjoined the mosque. He himself announced in the mosque the approach of his death. During the last days of his life he liberated his slaves, caused seven denars to be distributed among the poor, and prayed: "God support me in the agony of death." He expired in the arms of Ayesha. After a long dispute respecting the place of his interment, he was buried in the house in which he died. This spot lies now within the enlarged mosque. His only surviving child was Fatima, the wife of Ali, and the ancestress of all the sherifs or nobles of the Mohammedan world.—Mohammed is said to have been of middle stature, and to have had a strong beard and thick hair, a noble mien, a brown and lively complexion, brilliant eyes, white teeth, and a modest bearing. He possessed natural eloquence, a keen intellect, an overwhelming fluency, and great courage. Conjugal love he regarded as one of the great incentives to devotion. The wish to have a son to succeed him has been alleged as the reason why he took so many wives. In his infancy as well as in after life he was afflicted with epileptic attacks, which at first were considered by himself and by his enemies to be the effect of demoniacal possession. The same spasmodic convulsions accompanied him while he received his revelations. Mohammed was acquainted with the doctrines of both Jews and Christians, but charged them with having corrupted their Scriptures. He attributed to both of them opinions which they do not hold, but most of these statements may rest on the authority of the apocryphal books of the ancient Christian church. Before the 12th century it was hardly understood in the West that Mahomet was a man, and not a pretended divinity, and still earlier he was known as Maphomet, Baphomet, or Bafum, and believed to be a false god to whom human sacrifices were offered. Later it was common among Christian writers to represent him as a conscious impostor. This opinion has now but few representatives.—Among the Mohammedan biographies of the prophet, those of Wakidi, Ibn Ishak, and Tabari are the most important, and some of them have been translated into French, German, and other languages. Among the best European and American biographies of Mohammed are those of Marracci (Padua, 1698), Gagnier (Amsterdam, 1732), Hammer-

Purgstall (Leipsic, 1837), Weil (Stuttgart, 1843), George Bush (New York, 1832), Washington Irving (1850), A. Sprenger (Allahabad, 1852; German, Berlin, 1861-'6; 2d ed., 1869 *et seq.*), Muir (London, 1858), Arnold ("Ishmael, or a Natural History of Islamism," 1859), and Nöldeke (Hanover, 1863). See also *Essai sur l'histoire des Arabes avant l'Islamisme pendant l'époque de Mahomet, et jusqu'à la réduction de toutes les tribus sous la loi musulmane*, by Causin de Perceval (3 vols., Paris, 1847-'8); *Mahomet et les origines de l'Islamisme*, by Ernest Renan, included in his *Études d'histoire religieuse* (Paris, 1857; 7th revised ed., 1864); an English biography of Mohammed with critical commentaries by Mouvi Syed Ameer Ali, an oriental lawyer residing in London (1873); the essay "Islam" in "Literary Remains of Emanuel Deutsch" (1874); and "Mohammed and Mohammedanism," by R. Bosworth Smith (1874).

MOHAMMED II., a Turkish sultan, surnamed the Great and the Victorious, born in Adrianople in 1430, died near Scutari in Asia Minor in May, 1481. He was the eldest son of Amurath II. by a Christian princess of Servia, and succeeded him in 1451. He began his reign by murdering his two brothers, calling his father's treasurers to a strict account, and repelling a Caramanian invasion. He next invested Constantinople, April 6, 1453, with a large fleet and an army of more than 250,000 men. The city was taken by storm, May 29, and for three days given up to pillage and massacre. Having determined, however, to make Constantinople his capital, he proclaimed religious toleration and various privileges and immunities to the inhabitants. He completed the conquest of Servia in 1454, but in 1456 was baffled by Hunyady in the siege of Belgrade, where the Turks were repulsed with the loss of 25,000 men, while the sultan himself was severely wounded and compelled to raise the siege. He next turned his arms against the Morea, which was still held by two Greek princes, Demetrius and Thomas, the latter of whom made a gallant though unsuccessful resistance. The conquest of the Morea was completed in 1460, with the exception of a few fortified seaports held by the Venetians. In 1461 he conquered Trebizond, and had its emperor David Comnenus put to death. He also seized Wallachia and most of the islands of the Archipelago. The prince of Mytilene defended his island for a month, when he surrendered on condition of receiving an indemnity; but Mohammed soon put him to death. Several Christian powers now agreed in a conference held at Mantua to enter on a new crusade against the Turks; but owing to the internal difficulties of the European kingdoms this scheme fell through. Scanderbeg gave the first serious check to Mohammed by defeating several Turkish armies sent against him. The sultan at length (1465) invaded Albania in person with about 200,000 men, and laid siege to Croia, Scanderbeg's capital; but after

heavy losses he was forced to retreat. In the following spring he renewed the attempt, but was again obliged to withdraw. After the death of Scanderbeg, in January, 1467, Albania soon became a Turkish province. During the war with Scanderbeg the sultan was also engaged in hostilities with the Hungarians and the Venetians. From the latter he conquered Negropont in 1470, after a siege of Chalcis, the capital, in which he lost 40,000 men; and though the governor of the city surrendered on condition of personal safety, he was put to death, as were all the rest of the captives. The Venetians now entered into an alliance against the Turks with Pope Sixtus IV., the kings of Naples and Cyprus, the grand master of Rhodes, and the shah of Persia. The fleets of the European allies attacked the coasts of the sultan's dominions and burned Smyrna and other places, while the Persians invaded the eastern districts of Turkey in great force, and defeated Mohammed's eldest son Mustapha in a pitched battle near the Euphrates. Mohammed himself, with 300,000 men, encountered the Persians in Armenia, and was at first defeated. In a second battle he was victorious, and the Persians suffered such severe loss that they withdrew from the alliance and concluded a peace with the sultan in 1474. In 1475 Mohammed wrested Kaffa and other Crimean ports from the Genoese, and made the khan of the Crim Tartars tributary. But at the siege of Rhodes (1480) he was repulsed by the knights of St. John again and again for three months, suffered immense losses, and had to abandon the undertaking. Meanwhile he captured the Ionian islands and the city of Otranto. The latter was recovered in 1481 by the Italian states, aided by Spain, Portugal, and Hungary. The sultan was preparing to renew the attack on Rhodes when he died, not without suspicion of poison, after an illness of three days. Mohammed II. was one of the ablest of the Turkish sultans, and is glorified as the conqueror of two empires, 12 kingdoms, and 200 cities. He is thus described by Richard Knolles in his "History of the Turks" (1610): "He was of stature low, square set and strong limbed. His complexion was sallow, his countenance stern, and eyes piercing, though a little sunk. His nose was so high and crooked that it almost touched his upper lip." Collections of his letters translated into Latin have been published at Lyons (1520), Basel (1554), Marburg (1604), and Leipsic (1690).

MOHAMMED IV., a Turkish sultan, born in 1642, died about the close of 1692. In 1648 he succeeded his father Ibrahim I., who had been deposed and strangled by the janizaries. Mohammed Kuprili or Kuperli, an Albanian, was made grand vizier. To him, and to his son who succeeded him, the reign of Mohammed IV. owes all its celebrity. The sultan had neither talent nor energy, and cared little for anything but hunting, in which he spent most

of his time, and lavished vast sums. The empire at his accession was in the utmost confusion, but Kuprili restored order by promptly putting to death the leaders of sedition. Ibrahim, at war with Venice, had conquered the greater part of Candia in 1645, and the war continued after Mohammed's accession. The Venetians defeated the Turkish fleet in the Archipelago in July, 1651, and destroyed a second fleet, July 6, 1656, and shortly afterward captured the islands of Lemnos and Tenedos, which the Turks regained in the following year. The contest continued with various fortune till 1667, when Ahmed Kuprili, one of the greatest of Turkish generals, who had succeeded his father as grand vizier in 1661, undertook the siege of the city of Candia, which he prosecuted with vigor for two years and four months, when the Venetian commander Morosini was compelled to capitulate, Sept. 16, 1669, while at the same time peace was concluded between Venice and Turkey. In 1660 war had broken out with Austria, and for some time the Turks had been highly successful in Hungary. Germany, France, and Italy combined to check their progress, and Montecuculi, general of the allies, gained a brilliant and decisive victory over them, Aug. 1, 1664, at St. Gothard on the Raab, which, followed by the treaty of Temesvár, put an end to the war. In 1672 the sultan invaded Poland in person, and took Kamenetz; but John Sobieski, then grand marshal of the kingdom, in 1673 gave the Turks a total defeat at Khotin, and in 1676 obtained an honorable peace. An insurrection of the Hungarians under Tökölyi tempted the sultan in 1682 to make war again upon the emperor; and in July, 1683, an army of 300,000, commanded by Kara Mustapha, invested Vienna. The emperor fled with his family to Linz. The city was in the last extremity when Sobieski and Charles of Lorraine came to its relief, and on Sept. 12 totally routed the Turks, who suffered immense losses. After this the Turks met with nothing but disaster. Germany, Poland, Russia, and Venice combined against them; and on Aug. 12, 1687, Charles of Lorraine gave them a terrible defeat at Mohács, which was followed by the loss of Transylvania and other provinces. The Turkish army at length mutinied at Belgrade, marched to Constantinople in the latter part of 1687, dethroned the sultan, and raised his brother Solymán III. to the throne. Mohammed was kept in prison till his death.

MOHAMMED ALI. See MEHEMET ALI.

MOHAMMEDANISM, the name commonly given in Christian countries to the religion established by Mohammed. The Mohammedans do not themselves acknowledge the name. They call their religion Islam, which means "full submission to God," and themselves Moslems, or "the people of the Islam." Mohammed designated himself as the restorer of the pure religion revealed by God to Abraham. As the messenger of God he required his pagan coun-

trymen to leave their idols and adopt the worship of the one true God; the Jews, to exchange the law of Moses for the new and final revelations given to him; the Christians, to cease worshipping Christ as God, as inconsistent with monotheism and with the true doctrine of Christ himself. The doctrines of Mohammedanism may in large measure be traced to the national religion of the Arabs before Mohammed, to those forms of Judaism and Christianity which existed in Arabia in his time, and to those traditions and usages which were the common heritage of all branches of the Semitic race. To what extent Mohammed borrowed from these three sources the profound researches instituted during the last half century have begun to reveal.—The sayings of Mohammed relative to his religion were collected in the Koran, which is recognized by all Mohammedan sects as their rule of faith and morals. (See KORAN.) But the great majority of the Moslems recognize, in addition to the Koran, the Sunna, or traditions, embodying the expressions, occasional remarks, and acts of Mohammed, which are traced to his companions, his wives, and the first caliphs. Not only do they regulate, conjointly with the Koran, the doctrines, rites, and ceremonies of the Mohammedans, but the interpretation of the Koran is in a great measure determined by them. There is much uncertainty among the Moslems regarding them; the rationalistic Montasals and the extremists among the Shi'ahs reject the Sunna altogether; the moderate Shi'ahs acknowledge a tradition, but differ with the Sunnis respecting its extent. (See SHI'AHS, and SUNNA.) Among the Sunnis four orthodox schools were distinguished, all established between 740 and 840. They were called, after their founders, Hanifites, Malekites, Shafaites, and Hanbalites. The first and fourth were of little influence; the second prevailed in northern Africa and Spain, and the third in the eastern countries. Their differences were only in discipline. The two largest and most influential collections were made by Bokhari (died about 870) and Abu Moslim his pupil. An extract from these two and some later collections was made by Hosein ibn Masud (died about 1120), under the title *Masabih*. It was translated into English, together with a commentary (*Misheat*) by Wadi ed-Din Abu Abdallah Mahmoud, who lived about 1170, by A. N. Mathews ("Misheat ul-Masabih, or a Collection of the most Authentic Traditions," 2 vols., Calcutta, 1809-'11). Most of the traditions received by the Shi'ahs are contained in the books *Hayat ul-Kulub*, *Hag ul-Yaqin*, and *Ain ul-Hayat*, written by Mollah Mohammed Bakir Majlisi, a famous Persian divine, who lived about 1650, which were printed in Teheran in 4 vols. fol. In the 8th and 9th centuries the rationalistic school, called by their opponents Montasals or Separatists, gained great strength and influence. Their chief seat was at Bassorah, where they formed an association of rationalistic scholars.

They maintained the absolute self-determination of man, denied the eternity of the Koran, and rejected the reality of the divine attributes so far as to divest God of all those characteristics which are the expression of a personal existence. In the 10th century an orthodox school of scholasticism regained the ascendancy, and from this time the doctrines and the ethics of the prevailing denomination underwent no other considerable change. The gradual development of Mohammedan doctrines and their relation to the Koran are still subjects of controversy. We give an outline of the system of doctrines and ethics which generally prevails.—The fundamental doctrine of Islamism, and the only one which it is absolutely necessary to profess in order to be considered a Moslem, is: "There is but one God, and Mohammed is his apostle." The idea of God held by Mohammedans does not differ essentially from the Christian, except that they reject entirely the doctrine of the Trinity. They believe that a great number of prophets have been divinely commissioned at various times, among whom six were sent to proclaim new laws and dispensations, viz., Adam, Noah, Abraham, Moses, Jesus, and Mohammed. To the prophets were revealed certain scriptures inspired by God. All of these have perished except four, the Pentateuch, the Psalms, the Gospel, and the Koran. The first three, they maintain, have been falsified and mutilated, and the Koran supersedes them all. Mohammed is the last prophet, and the Koran the final revelation. The Mohammedans regard Christ with a reverence second only to that which they pay to Mohammed, and blasphemy of his name is punishable with death. But they deny that he is God or the son of God, though they consider his birth miraculous. They also deny that he was crucified, believing that some other person suffered in his place, while he was taken up to God. He will come again upon the earth to destroy Antichrist, and his coming will be one of the signs of the approach of the last judgment. The Moslems believe in the existence of angels with pure and subtle bodies created of fire, who have no distinction of sex, neither eat nor drink, and are employed in adoring and praising God, interceding for mankind, keeping a record of human actions, and performing various other services. Four are held by God in peculiar favor: Gabriel, who is employed in writing down the divine decrees, and by whom the Koran was revealed at various times to Mohammed; Michael, the especial guardian of the Jews; Azrael, the "angel of death," who separates the souls of men from their bodies; and Israfil, who will sound the trumpet at the resurrection. There is also a class of beings lower than the angels, like them made of fire, but of a coarser nature, called jinns (generally rendered genii), who eat and drink and are subject to death. Some of these are good, some evil. The chief of the latter is Eblis or "despair," who was once an angel named Azazel, but

who, having refused to pay homage to Adam, was rejected by God, and wanders over the earth until the resurrection. These genii have various names, as *peri*, fairies; *div*, giants, fates, &c. In regard to the state of man during the time between death and the resurrection, many different opinions prevail. There are also different views as to the last judgment, but the essential point agreed upon by all is that men will have awarded to them that condition of happiness or misery to which God shall judge them entitled by their conduct and belief during this life. The time of the resurrection is known only to God; its approach will be indicated by certain signs, among which will be the decay of faith among men, wars, seditions, tumults, the advancement of the meanest men to the highest dignities, an eclipse, the rising of the sun in the west, and numerous other portents. After the judgment all must pass over the bridge Al-Sirat, which is finer than a hair, sharper than a sword, and beset on either side with thorns. The good will pass over easily and speedily; the wicked will fall headlong into hell. The delights of heaven are for the most part sensual, made up of pleasures especially suited to each of the senses, while the torments of hell consist chiefly in the extremes of heat and cold. For those who wish more of detail as to their views of the future state, the preliminary discourse to Sale's translation of the Koran is the most accessible work. The Moslems hold that all who believe in the unity of God will finally be released from punishment and enter paradise. Those who deny the absolute unity of God, idolaters, and hypocrites will suffer eternally. To hypocrites they assign the lowest place in hell. They believe in the absolute foreknowledge and predestination of all things by God, and at the same time in the responsibility of man for his conduct and belief.—Their practical religion, which they call *din*, chiefly insists upon four things: 1, purification and prayer, which they regard as together making one rite; 2, almsgiving; 3, fasting; 4, the pilgrimage to Mecca. Prayer must be preceded by ablution; cleanliness is regarded as a religious duty, without which prayer would be ineffectual. The Moslems pray five times each day, soon after sunset (not exactly at sunset, for fear they should be considered sun worshippers), at nightfall (generally about an hour and a quarter after sunset), at daybreak, near noon, and in the afternoon. The times of prayer are announced by the muezzins (mueddzins) from the minarets of the mosques. In praying, the believer must turn his face toward Mecca, and the wall of the mosque nearest that city is marked by a niche. Twice during the night the muezzins also call to prayer, for those who wish to perform extra devotions. Prayers may be said in any clean place, but on Friday they must be said in the mosque. The regularity and devotion with which the Moslems perform this duty are testified to by all who

have visited the East. Women are not forbidden to enter the mosque, but they never do so when the men are at their devotions. Before prayer all costly and sumptuous apparel must be laid aside. Almsgiving was formerly of two kinds: legal, called *tzekah*, and voluntary, called *sadakah*. The former was in reality a tax paid to the sovereign, and by him distributed as he saw fit; it has long since fallen into disuse. The *sadakah* consists of cattle, money, corn, fruits, and wares sold. It is given once a year, and generally amounts to about 2½ per cent. of the stock on hand; but no alms are due unless the stock amounts to a certain quantity, nor unless the articles have been in the owner's possession for eleven months. At the end of the fast of Ramadan every Moslem is expected to give alms if he is able, for himself and each member of his family—a measure of wheat, rice, or other provisions. The Moslems also lay great stress upon fasting. During the whole of the month Ramadan they fast from the rising to the setting of the sun; they neither eat nor drink nor indulge in any other physical gratification. They observe this fast with great rigor, but certain classes of persons to whom the fast would be physically injurious are excused from its observance. There are other days during which fasting is regarded as specially meritorious though not obligatory, and fasting at any time is regarded as peculiarly acceptable to God. The pilgrimage to Mecca, called *hadj*, is a relic of the ancient idolatrous religion which Mohammed desired to do away with, but which was too deeply rooted in the habits and interests of the people to be abolished. Hence he sanctioned it and made it obligatory, having first destroyed the idols in the temple and introduced new regulations. All Moslems, men or women, should at least once during their lives, provided they are able, make the pilgrimage to Mecca. The duty may be performed by a substitute, in which case the whole merit redounds to the principal. He who has performed this pilgrimage is entitled to prefix to his name the word *hadji*. Of late years the number of pilgrims has greatly fallen off.—The Moslems regard the Koran not only as the rule of their religious but also of their civil and social life. Before the time of Mohammed it was not uncommon among the Arabs to put to death their female children. This practice was forbidden by him. The following things are also forbidden in the Koran: eating of blood, or the flesh of swine, or of any animal that dies of itself, or has been strangled or killed by accident or by another beast, or has been slain as a sacrifice to an idol; playing games of chance, whether with or without a wager; the drinking of wine or of any inebriating liquor, but some construe this prohibition as only applicable to their excessive use, while a few of the very strict construe it as applying to opium, bang, and even coffee and tobacco; the taking of interest upon money lent, even when the loan is

made to a person of a different religion, divination, and various other superstitious practices. Murder seems to be regarded by the Koran as a crime against individuals rather than against society; hence it was punishable with death or a pecuniary fine, at the option of the family of the murdered man. But at present in the Turkish empire murder is punished with death, and commutation by fine is not permitted. If a believer kill another accidentally, the slayer must pay a fine and redeem a believer from slavery. The punishment for theft is cutting off the hand, but in modern times this has generally fallen into disuse, and the bastinado or imprisonment has been substituted. Polygamy existed among all the Semitic nations previous to the time of Mohammed, and he restricted rather than extended it. While claiming for himself special privileges in regard to his domestic relations, asserting that they were allowed him by the direct permission of God, he limited the number of wives which a true believer might take to four. Divorce is very easy in theory, but very rare in practice. The husband has merely to say to his wife, "Thou art divorced." He may receive her back, and again divorce her; but if he divorce her a third time, he cannot take her back until after she has been married to some other man and been divorced by him, or has become a widow. Aside from the domestic relations, the ethics of the Mohammedan religion are of the highest order. Pride, calumny, revengefulness, avarice, prodigality, and debauchery are condemned throughout the Koran; while trust in God and submission to his will, patience, modesty, forbearance, love of peace, sincerity, truthfulness, frugality, benevolence, liberality—indeed, aside from the differences of opinion in regard to theological subjects, all those qualities which the Anglo-Saxon race have idealized under the term "Christian gentleman," are everywhere insisted upon. Mysticism and asceticism were early cultivated by the Moslems, and called forth Sufism, the monachism of the Islam, a phenomenon of the greatest importance for a right understanding of the true character and the bearing of their doctrinal system.—On their first promulgation the doctrines of Mohammed spread with amazing rapidity. In 12 years the whole of Arabia had embraced the Islam. Abubekr, the first caliph, declared war against all nations, especially against the emperor of Constantinople and "the great king of Persia," at that time the two most powerful monarchs of the world. The battle of Bostra opened Syria to the Arabs; and one of the first feats of Omar, the successor of Abubekr, was the conquest of Damascus. Soon afterward a battle near the lake of Gennesaret decided the fate of Syria. Jerusalem capitulated on easy terms, and with brief interruptions has remained subject to the Mohammedans, and is one of their three holy cities. Amru, a general of Omar, completed the conquest of Egypt,

and fairly commenced that of northern Africa. On the S. shore of the Mediterranean the Arabs met with little resistance. Soon after the death of Omar, Persia was entered by Khalid, Irak or Assyria was subdued and plundered, the Euphrates together with the gulf of Persia fell into the hands of the Arabs, and Ctesiphon and Farsistan, whither the king of Persia had fled, came under Moslem domination. On the appointment of Ali to the caliphate those great internal struggles commenced which have ever since rent the Mohammedan world, without however arresting its external growth. Moawiyah, the rival of Ali, took possession of most of the Persian provinces, and established the Islam in Europe by getting a foothold in Sicily. He was still more fortunate in Africa, and from 697 the whole of northern Africa may be considered as the home of Islamism. At the beginning of the 8th century the Mohammedans, under Tarik, crossed to Spain; one province after another was speedily subdued, and for 800 years the Saracens retained a dominion in that country. A few years later Abderrahman with a force of 400,000 Moslems entered Gaul, but they were defeated in the decisive battle between Tours and Poitiers by Charles Martel (A. D. 732), which put a final stop to their progress in western Europe. They advanced eastward into China and India; in the former country their progress was soon stayed, but in the latter they founded vast empires on the shores of the Indus and Ganges, which for a long time were strongholds of Islamism. Fresh energy was infused into the Moslem community by the accession of the Seljuk Turks. Being called to his aid by Mohammed ben Jubriel, they seized upon Persia, mastered a portion of the Byzantine empire, and established one of the seats of their government at Iconium or Konieh. Having withstood the repeated attacks of the Christian world during the period of the crusades, they were overrun by other Tartar tribes, who passed over Persia, Armenia, and Asia Minor, and laid the foundation of the empire of the Ottomans, or Turks properly so called. Both the Seljuks and their successors, the Osmanlis, voluntarily received Islamism from the people whom they conquered. The Ottoman rulers gradually undermined the Byzantine empire; Amurath I. entered Europe and made Adrianople his capital; Amurath II. left nothing to the Greek emperor but Constantinople; and Mohammed II. struck the fatal blow, taking Constantinople in 1453. The Ottoman empire, and with it the political power of the Islam, were now at their zenith; the Turks became for many centuries the terror of Italy, Hungary, and Germany, but Christendom soon ceased to suffer any considerable losses by their advance. On the other hand, the Christian nations began to conquer considerable portions of Moslem territory. Sicily had been lost before this period; in Spain their last strongholds were taken in 1492. Greece commenced

its successful struggle for independence in 1821; Algiers was wrested from them in 1830; and the dependence of the Danubian principalities on the Ottoman Porte long since became merely nominal. But Mohammedanism continues to make peaceable conversions in the interior of Africa, where many of the most intelligent tribes and kingdoms have adopted the Arabic faith and culture. Several nations of the Indian archipelago have been converted at a recent period, and in Malabar the Mohammedans purchase or procure children of the lower classes to bring them up in the "true faith." But while the Islam advances among races inferior to the original Mohammedans in point of civilization, its foremost representative among the great nations, the Ottoman empire, lives awed by the mercy of the great powers of Europe; Persia and Turkistan have felt the superiority of Russia, and Morocco has been defeated by Spain.—The total number of Mohammedans at the present time is estimated at about 180,000,000. In Europe they are almost confined to Turkey, and even there they form but a fourth of the population, about 4,000,000 out of 16,500,000 (including Roumania), and are constantly decreasing. In European Russia they count about 2,400,000 souls; in Asiatic Russia, 5,000,000. They prevail in Asiatic Turkey, Persia, Afghanistan, Beloochistan, Arabia, and Tartary, and are largely represented in India and the Indian archipelago, and to some extent in China. In India the census of 1872 revealed the fact that the number of Mohammedans, as well as of the total population, had been greatly underestimated. Their number had been placed at 25,000,000, but they are now estimated at 41,000,000. The fact that the Mohammedan religion ignores all distinctions of caste, and at once raises the new convert to full social equality, tends greatly to promote its spread among the Hindoo population. It is believed that in Africa about 100,000,000 may be set down as Mohammedans. In America and Australia they are not represented at all. More detailed accounts of the several national branches of Mohammedans will be found in the articles devoted to the Mohammedan countries. See also the articles on the Arabic, Persian, and Turkish literatures.—One of the best treatises on Mohammedanism is that of Dollinger, *Muhammed's Religion nach ihrer innern Entwicklung und ihrem Einflusse auf das Leben der Völker* (Ratisbon, 1838). See also Taylor, "History of Mohammedanism;" Mill, "Mohammedanism" (London, 1817); Arnold, "Ishmael, or a Natural History of Islamism" (1859); "Islam, its History, Character, and Relation to Christianity" (Boston, 1874); and works cited under MOHAMMED.

MOHAVE, the N. W. county of Arizona, bounded N. by Utah and W. by California and Nevada, from which it is separated for the greater part by the Colorado river; area, about 10,500 sq. m.; pop. in 1870, 179. It is

intersected in the north by the Colorado, which here enters the Grand Cañon, and in the south by Bill Williams fork. The lower portion of the Colorado valley is from 2 to 10 m. wide, possessing a rich alluvial soil, generally covered with a dense vegetation, and well wooded with mezquite and cottonwood. Parts of the county E. of the valley are rolling and hilly, covered with nutritious grasses and an abundance of timber; but the greater portion is rocky and desolate, seamed with precipitous cañons. Gold, silver, copper, and lead are found in the mountains, and some mining is carried on. Capital, Mohave City.

MOHAVES, an Indian tribe on the Mohave and Colorado rivers, Arizona, being part of the Yuma nation of the Pima family. They call themselves Amockhavé, and were known to the Spaniards by several names, as the Jamajabs, Cosminas, &c. Their territory extended from lat. 34° to 35°. They are warlike, tall, well formed, and industrious cultivators of the soil. They paint themselves from head to foot with ochre, clay, and charcoal. The men wear little more than a breech cloth, and the women a double apron of strips of bark and vegetable fibre; both sexes wear necklaces of shell; the men exclusively wear eagle feathers, and if wealthy nose pendants. The houses are made of logs with a wide shed in front, but some live in mere hovels of brush. They store grain and mezquite beans in circular thatched granaries of osier twigs and very large earthen jars. They have several times come into collision with the United States troops, but are now quite peaceful to the whites, though occasionally at war with the Chemehueves. They are rapidly declining, being almost all infected with disease. A reservation of 181,200 acres on the Colorado has been assigned to them, but fewer than 1,000 reside upon it. They have lost severely by epidemic diseases, and are now roughly estimated at 840 on the reservation and 2,000 to 3,000 not yet brought in. They have no schools nor missionaries.

MOHAWK, a river of New York, which rises in Oneida co., about 20 m. N. of Rome, from which place it flows S. E. and E. through Herkimer, Montgomery, Schenectady, and Saratoga counties, falling into the Hudson at Waterford, 10 m. above Albany; length, 135 m. At Little Falls, Herkimer co., and "The Noses," Montgomery co., the river has forced its way through mountain barriers, and flows through deep, rocky ravines; and at Cohoes, 1 m. from its mouth, it falls over a precipice 70 ft. in perpendicular height. During its course it supplies valuable water power. The Erie canal and the New York Central railroad follow its banks as far as Rome. Rome, Utica, Little Falls, Schenectady, Cohoes, and Waterford are the principal towns on its banks.

MOHAWKS. See AGMEEUE.

MOHEGANS, or *Mohicans*, an Algonquin tribe, found by the Dutch holding both sides of the Hudson river for about 75 m. They received

the Dutch amicably, and gave them lands on which they erected Fort Orange (Albany). They were then at war with the Mohawks, and erected a fort opposite the Dutch. The commandant of Fort Orange, Krieckebeck, accompanied them on an expedition against the Mohawks, but was defeated and killed. In 1628 the Mohegans, attacked by the Mohawks, fled to the Connecticut river. A part of the nation had gone eastward some years before and settled on the Thames, where they were generally known as Pequots, of whom Sassacus was chief; but some of them who seceded under Uncas were called Mohegans. In the war of the English against the Pequots, these Mohegans aided the colonists. The Mohegans of the Hudson, or River Indians, gradually returned to that river. They kept up an occasional intercourse with the French from an early period through the Algonquin tribes in Canada, and are known in French annals as Loups or Wolves, that being the meaning of Mohegan. When the English about 1690 began the great struggle against the French, the Mohegans as a body made peace with the Mohawks, and joined the English with war parties. By 1700 they were reduced to 200 warriors, and the Connecticut Mohegans to 150, 100 of whom were in the service of the colony. In 1736 Sargeant collected some of the latter at Stockbridge, and from 1740 to 1744 the Moravians maintained a Mohegan mission at Shekomeko, in Dutchess co., N. Y., which led some of the Mohegans to remove to the Susquehanna, where they became a distinct element in the Moravian towns. During the revolution the Mohegans joined the Americans, and figured at Bunker Hill, White Plains, and Barren Hill. After the war Samson Occum, an educated Mohegan clergyman, and David Fowler gathered several Indians, chiefly Mohegan and Long Island Indians, who emigrated to Oneida in 1788, and became known as the Brotherton Indians. Those who remained in Connecticut had dwindled in 1842 to 60 or 70. Between 1820 and 1880 the Stockbridge Indians emigrated from Oneida to Green bay; the Brotherton Indians also removed to Wisconsin, where they finally abandoned their tribal relation, and in 1839 became citizens, as did many of the Stockbridges. The remainder of the latter band of Mohegans are with some Munsees on a reservation at Red Springs, numbering about 100. They have almost entirely given up their own language for English. For their language see "Observations on the Language of the Muhhekaneew Indians," by Jonathan Edwards (New Haven, 1788).

MOHILEV, or Moghilev. I. A W. government of European Russia, bordering on Vitebsk, Smolensk, Orel, Tchernigov, and Minsk; area, 18,545 sq. m.; pop. in 1867, 908,858. The surface is generally level and the soil fertile. The climate is mild and dry. There are several small lakes and marshes. The principal river is the Dnieper. Bog iron is found in

abundance. II. A city, capital of the government, on the right bank of the Dnieper, 312 m. W. S. W. of Moscow; pop. in 1867, 38,922, including many Jews. It is the seat of a Greek archbishop, and of the Roman Catholic archbishop and primate of Russia and Poland, has 4 convents, about 80 churches and 20 synagogues, a gymnasium, a Greek and a Roman Catholic theological seminary, and many manufactories. It is a favorite residence of the Russian nobility. It was taken by Charles XII. in 1708, and recovered by Peter the Great in 1709. A portion of the Russian army was defeated there by the French, July 23, 1812.

MOHL. I. **Hugo von**, a German botanist, born in Stuttgart, April 8, 1805, died in Tübingen, April 1, 1872. He studied medicine and the natural sciences at the university of Tübingen, and in 1835 became professor of botany and director of the botanic garden. The establishment in 1863 of a special faculty for natural sciences was entirely due to his influence. He published many works, and is one of the highest authorities on vegetable physiology. II. **Robert**, brother of the preceding, born in Stuttgart, Aug. 17, 1799, professor of jurisprudence at Tübingen and Heidelberg, and prominent as a legislator and diplomatist of Baden, has published, among other works, *Die Polizeiwissenschaft nach den grundsätzen des Rechtsstaats* (3 vols., Tübingen, 1832-'4; 3d ed., 1866); *Die Geschichte und Literatur der Staatswissenschaft* (3 vols., Erlangen, 1855-'8); and *Staatsrecht, Völkerrecht und Politik* (3 vols., 1860-'69). III. **Julius**, brother of the preceding, born in Stuttgart, Oct. 28, 1800, was extraordinary professor of oriental literature in Tübingen from 1826 to 1832, when he went to Paris, in 1845 became professor of Persian in the collège de France, and in 1852 director of the oriental department of the national printing office. He has edited Firdusi's *Shah Nameh* (5 vols., Paris, 1838-'66), and many Chinese and other oriental works, and written *Dante et les origines de la littérature italienne*, &c.

MÖHLER, Johann Adam, a German theologian, born at Igersheim, Württemberg, May 6, 1796, died in Munich, April 12, 1838. He studied at Mergentheim, Ellwangen, and Tübingen, was ordained priest of the Roman Catholic church in 1819, and in 1820 became tutor in the seminary of theology at Tübingen, and in 1822 private lecturer on theology. Before entering on his new office he visited the principal Catholic and Protestant universities of Germany. On his return he began in 1823 a course of lectures on church history, patrology, and canon law, which at once established his reputation. He strongly sympathized with the reformatory movement then agitating the Catholic church of S. W. Germany; he advocated the restoration of communion in both kinds, the abrogation of the use of Latin in the divine service, &c.; but in later years he abandoned these views, and the articles expressing them are not included in the collec-

tion of his minor works published by Dr. Döllinger (*Gesammelte Schriften und Aufsätze*, 2 vols., Ratisbon, 1839). In 1825 he published *Die Einheit in der Kirche*, and in 1826 he was appointed extraordinary professor in Tübingen. In 1827 he published *Athanasius der Grosse* (2 vols., Mentz), and an essay on sacerdotal celibacy, directed against the liberal Catholic theologians of Baden and Württemberg, followed in 1829 by *Fragmente aus und über Pseudo-Isidor*. In 1828-'30 he gave a course of lectures on the comparative theology of the Christian churches, a summary of which was published under the title *Symbolik, oder Darstellung der dogmatischen Gegensätze der Katholiken und Protestanten nach ihren öffentlichen Bekenntnisschriften* (2 vols., Mentz, 1832; 7th ed., Ratisbon, 1871; English translation by Robertson, 2 vols., London, 1843). This is regarded as his greatest work. The Protestant theologians maintained that he had represented ideal Catholicism, and misrepresented, at least partly, the doctrinal systems of the reformers. Some of the most distinguished Protestant divines wrote against him; especially Baur (*Der Gegensatz des Katholicismus und Protestantismus*, Tübingen, 1833; 2d ed., 1836), Marheineke, and Nitzsch. Möhler answered them in his *Neue Untersuchungen der Lehrgegensätze zwischen Katholiken und Protestanten* (Mentz, 1834). Baur replied again in the new edition of his work, but the continuation of the controversy was forbidden by the government, and Möhler was censured for reviving an obsolete contest. He consequently resigned his professorship at Tübingen, and when the Prussian government offered him one either at Bonn, Breslau, or Münster; he chose Bonn, but subsequently declined when the archbishop of Cologne demanded that he should expressly retract his work on "Unity in the Church." In the spring of 1835 he began in the university of Munich a course of lectures on the Epistle to the Romans, followed by others on church history and patrology; but his lectures were interrupted by sickness in 1836, and he never fully recovered. In 1838 the king of Bavaria appointed him dean of Würzburg. At the time of his death he was collecting materials for a history of monachism. A large posthumous work on the Christian literature of the first three centuries was edited by Prof. Reithmayr of Munich (*Patrologie*, vol. i., Ratisbon, 1839). A Catholic biography of Möhler, by Reithmayr, is added to the fifth edition of his "Symbolism." The best Protestant biography is that of Prof. Kling of Marburg.

MOHS, Friedrich, a German mineralogist, born at Gernrode, Anhalt, Jan. 29, 1773, died at Agordo, Venetia, Sept. 29, 1839. He was professor at Gratz from 1811 to 1817, when, after accompanying his pupil Count Brenner to England and Scotland, he succeeded Werner as professor of mineralogy at Freiberg, and in 1826 became professor at Vienna. He origi-

nated a new system of classification for minerals, which in the grouping of species regarded only their external characteristics. His principal works are *Grundriss der Mineralogie* (2 vols., Dresden, 1822-'4; English translation with additions by Haidinger, 3 vols., Edinburgh, 1825), and *Anfangsgründe der Naturgeschichte des Mineralreichs* (Vienna, 1832; 2d enlarged ed. by Zippe, 2 vols., 1836-'9).

MOIGNO (de Villebeau), François Napoléon Marie, a French scientific author, born at Guéméné, Morbihan, April 20, 1804. He studied successively at Pontivy and Ste. Anne d'Auray, entered the society of Jesus in 1822, and devoted himself especially to the study of physical and mathematical science. He discovered in 1828 a new formula for the equation of tangential planes, and in 1830 followed the exiled Jesuits to Brieg in Valais. There, while completing his course of theology and pursuing Greek and Latin literature, he learned English, German, Dutch, Italian, Spanish, Portuguese, Hebrew, and Arabic. In 1836 he was appointed professor of mathematics in the Jesuit school in Paris, where he acquired reputation as a preacher, helped to found several charitable institutions, and contributed to the press papers on science and theology. In 1840 he published the first two volumes of his work on differential and integral calculus, based on the method of Cauchy. He became secretly involved in ruinous engineering speculations, and his superiors, after paying a large sum of money to extricate him from his difficulties, appointed him professor of Biblical literature in the seminary of Laval. He resisted this appointment, and left the order in 1844. In 1845 he became scientific editor of the *Epoque*, and made a tour of observation through England, Belgium, Holland, and Germany, the result of which appeared in a series of remarkable letters to that journal. He became scientific editor of the *Presse* in 1850, and soon after of the *Pays*. In 1852 he founded the weekly scientific review *Cosmos*, of which he remained chief editor till 1863, when he established a separate scientific weekly, *Les Mondes*. He was chaplain of the lycée Louis-le-Grand from 1848 to 1851; was attached to St. Germain-des-Prés in 1863; and in 1873 was appointed a canon of St. Denis. His works embrace *Leçons de calcul différentiel et intégral* (4 vols., 1840-'61); *Répertoire d'optique moderne* (4 vols., 1847-'50); *Traité de la télégraphie électrique* (1849); *Le stéréoscope* (1852); *Le saccharimètre* (1853); *Impossibilité du nombre infini et de ses conséquences, démonstration du dogme de la création et de la récente apparition des mondes* (1863); *Résumés oraux du progrès scientifique et industriel* (1865-'9); *Cours de science vulgarisée* (1865-'66); *Leçons de mécanique analytique* (1867); *Les éclairages modernes* (1868); *L'Art des projections* (1872); and translations of three essays severally from Grove's, Hoffmann's, and Tyndall's scientific writings.

MOIR, David Macbeth, a Scottish author, born at Musselburgh, Jan. 5, 1798, died in Dumfries, July 6, 1851. He was educated at the grammar school of his native town, and obtained a diploma as surgeon in 1816. He contributed both prose and verse to Constable's "Edinburgh Magazine" and to "Blackwood." He was commonly known as Delta, from the signature Δ to his serious poems. In 1824 he published "The Legend of Genevieve, with other Tales and Poems," and in the same year began in "Blackwood" a serial novel, "The Autobiography of Mansie Wauch." In 1831 he published "The Ancient History of Medicine," and in 1843 "Domestic Verses," which contains some of his best known poems. In 1846 he met with an accident which made him lame for life. In 1851 he delivered in Edinburgh six lectures on the "Poetical Literature of the Past Half Century," which were afterward published. A selection of his poems, with a memoir by Thomas Aird, was published in 1852, and a new and complete edition of his works in 1857. He was the leading physician of Musselburgh till his death, which occurred during a tour of relaxation.

MOIRA, Earl of. See HASTINGS, FRANCIS.

MOIVRE, Abraham de, a French mathematician, born at Vitry, Champagne, May 26, 1667, died in London, Nov. 27, 1754. Upon the revocation of the edict of Nantes he took refuge in England, and devoted himself to teaching mathematics. He soon became connected with Halley and Newton, was admitted into the royal society in 1697, was elected a member of the academy of sciences of Berlin in 1730, and of the academy of sciences of Paris in 1754. He was one of the committee appointed to decide on the rival claims of Leibnitz and Newton to the invention of the differential calculus. He made many discoveries and improvements in the theory of series and of probabilities, but is best known by the celebrated trigonometrical theorem which bears his name. He survived most of his early associates, and his subsistence latterly depended upon his solutions of problems relative to games of chance, which he was accustomed to give in a coffee house. Besides memoirs in the "Philosophical Transactions," he published "The Doctrine of Chances" (1718), "Annuities on Lives" (1724), and *Miscellanea Analytica, de Seriebus et Quadraturis* (1730).

MOKANA, or Mocanna. See ATHA BEN HAKEM.

MOLA. I. Pietro Francesco, an Italian painter, born at Coldre, near Como, in 1612 or 1621, died in Rome about 1666. He was a pupil of Cesare d'Arpino and Albani. He was one of the best of the Italian landscape painters, and was much employed by Innocent X. and his successor Alexander VII., as also by Queen Christina of Sweden. **II. Giambattista**, a painter, sometimes erroneously called a brother of the preceding, born in France about 1618, died in 1661. He studied in Paris, and under Albani at Bologna. He excelled in landscapes.

MOLASSE, the name of a peculiar, mostly gray sandstone, found abundantly throughout a large portion of the Alpine system. It occurs in masses frequently alternating with beds of conglomerate, and being of a fine, granular texture, is highly prized as a building stone. Owing to the fact of its forming in certain localities one of the characteristic rocks of the tertiary formation, the term *molasse*, as applied to group, is sometimes used synonymously with tertiary, corresponding to the eocene, miocene, and pliocene of Lyell.

MOLASSES (Fr. *mélasse*), the sirup which remains in the manufacture of brown sugar, after separating from the juice all the saccharine matter that can be made to crystallize to advantage; also the inspissated juice of sorghum and sap of the maple. "Sugar-house" molasses is the sirup which remains in the conversion of brown into refined sugar, and which contains too little cane sugar to repay its further treatment. By fermentation and distillation molasses mixed with the skimmings of the sugar boiling is made to produce rum. (See SUGAR.) The entire amount of molasses produced in the United States in 1870, according to the census, was 6,593,323 gallons of cane, of which 4,585,150 gallons were the product of Louisiana, 16,050,089 of sorghum, and 921,057 of maple. The production of cane molasses is limited to the southern states, while the cultivation of sorghum is general throughout the country. During the year ending June 30, 1873, 43,533,909 gallons of molasses, valued at \$9,901,051, were imported into the United States, chiefly from Cuba.

MOLDAU, a river of Bohemia, which rises in the Bohemian Forest, on the frontiers of Bavaria, flows S. E. as far as Rosenberg, and then N. to Melnik, opposite which town it falls into the Elbe. It is about 300 m. long, and for nearly half its course is navigable. Its chief tributaries are the Luschnitz, Sazawa, Beraun, and Wattawa. The principal towns on its banks are Krummau, Budweis, Pisek, and Prague. Vessels of 60 tons can ply on it to Prague.

MOLDAVIA (Ger. *Moldau*; Turk. *Bogdan*), a country of Europe belonging to the Turkish empire, and now together with Wallachia forming the vassal state of Roumania. It is situated between lat. 45° and 49° N., and lon. 25° and 30° 15' E., and is bounded N., N. E., and E. by Bessarabia, from which it is separated by the Pruth, S. E. by the Black sea, S. by the Bulgarian district of Dobrudja and by Wallachia, being separated from the former by the Danube, W. by Transylvania, and N. W. by Bukowina; area, 18,435 sq. m.; pop. about 1,460,000. It is traversed in the north and west by various offshoots of the eastern Carpathians, through which several passes lead into Bukowina and Transylvania. The principal rivers are the Danube, which during its short course on the S. boundary receives the waters of all the others, the Pruth, and the Sereth. The chief affluents of the Pruth are

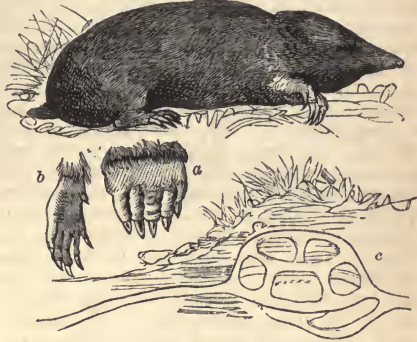
the Bakhlui and Shishiya; of the Sereth, the Bistritza, Moldava, Milkov, and Birlat. The largest lakes are between the mouths of the Pruth and Sereth and in the S. E. corner of the country. Moldavia is rich in pastures, and produces wheat, maize, and other grains, excellent melons, various wines, some of which rival those of Hungary, fruits, honey in great abundance, and several minerals, especially salt. The forests contain bears, wolves, and lynxes, and yield excellent timber; the rivers abound in fish. Locusts often appear in destructive multitudes. The inhabitants consist of Moldavians proper, of the Wallach race, Greeks, Armenians, Jews, Csángó-Magyars, Franks, and gypsies. The dominant religion is the orthodox Greek. The general language is the Wallachian, in which the preponderant Latin or Romanic element is largely mixed with Slavic, Turkish, and Tartar words. Agriculture, horticulture, and grazing are the principal occupations; manufactures are scarcely developed, and commerce is almost exclusively in the hands of the Greeks, Armenians, and Jews. Wine, honey, wax, cattle, hides, horses, and timber are the chief articles of export. The most important towns are Jassy, the capital, Galatz, Ismail, Fokshani, Roman, Baken, and Botoshan. — In ancient times this country, which at various periods extended beyond its present limits, was occupied by the Getæ. Darius Hystaspis invaded it on his expedition against the Scythians. In the latter part of the 1st century it belonged to the Dacian kingdom of Decebalus. Parts of it were attached after his defeat to the Roman province of Dacia. During the great migration of nations it was successively invaded by the Goths, Huns, Bulgarians, and Slavic tribes. The Avars, who became dominant in the 6th century, yielded to the Bulgarians, and these, after a few centuries, to the Khazars, Petchenegs, and others. The latter tribes successfully warred with the Magyars, but dissensions distracted the country, and the introduction of Christianity in the 11th century was almost without effect. Wars with the Greeks depopulated the country, which was soon after invaded by the Cumans. These in their turn were subdued by the Mongols. In the earlier part of the 14th century a strong Wallach immigration took place from Hungary under Bogdan, who with his son Dragosh established a dynasty of waywodes known in history under the name of the Dragoshites. The country now received the name of Moldavia from the river Moldava. The Greek creed was made predominant. But internal conflicts combined with external to make the long reign of the Dragoshites one of the bloodiest in history. Among the warlike princes of the period was Stephen VI., surnamed the Great, who died in 1504; but his son and successor Bogdan III. was unfortunate in his wars with the Hungarians and Poles, and having also suffered an invasion of the Tartars, he submitted himself to

the suzerainty of the Porte. Bogdan's son, Stephen VII., leaned toward the Christian powers; but his successor, Peter VI., allied himself closely with Sultan Solymán the Magnificent during his expedition against Vienna. Moldavia was now a vassal province of the Ottoman empire, and soon after lost its eastern division, between the Pruth and Dniester, now known as Bessarabia, which was constituted a separate Turkish province. This part was often reannexed and again detached. The suzerainty of the Porte little if at all ameliorated the condition of the distracted country. For some time the boyars exercised the privilege of electing the waywodes; later the sultans were called upon to appoint them. During the latter part of the 17th century and in the 18th, Fanariote Greeks mostly succeeded each other under the title of hospodar or prince. The principal families from which hospodars were selected were those of Cantacuzene, Cantemir, Ducas, Rakovitz, Mavrocordato, Ghika, and Ypsilanti. Most of the Fanariote hospodars leaned toward Russia, some of them secretly conspiring with Peter the Great and his successors. In the Turko-Russian wars Moldavia was a principal object of contention. In 1737 and 1738 it was successfully invaded by the Russians under Münnich. In the first Turkish war of Catharine II. it was occupied and organized as a Russian province, but restored to Turkey by the peace of Kutchuk Kainarji (1774), which, however, secured to Russia a kind of protectorate. Soon after, Moldavia, which meanwhile had been robbed of various important places, converted into Turkish fortresses, also lost its northern district, the Bukowina, which was annexed by Austria (1777). The same power afterward combined with Russia for a new attack on Turkey, and Moldavia again became a seat of war. Austria terminated the war by the peace of Sistova in 1791, Russia more advantageously by that of Jassy in the following year. The succeeding Turkish wars were closed by the treaties of Slobosia (1807) and Bucharest (1812), by the latter of which the czar Alexander gained Bessarabia. The Greek insurrection under Ypsilanti was a source of terrible suffering to the province. The treaty of Akerman (1826) restored the right of electing hospodars, for seven years, to a divan of boyars, the Porte retaining the right of confirmation, and Russia its protectorate. The war of 1828 again brought Moldavia, as well as Wallachia, into the hands of the Russians, who occupied it, under Kisseleff, even after the peace of Adrianople (1829), which excluded all Turks from a permanent abode in it, a new statute being elaborated by a commission of boyars. This being confirmed by the Porte, the Russian army left the principalities, and Michael Sturdza, a native boyar, was elected hospodar of Moldavia for life. To unite the two principalities, as an independent Dacian or Rouman state, became now the

chief tendency of the national party. Sturdza often gave umbrage to the representatives of Russia and a revolutionary outbreak in Wallachia in 1848 was again followed by a Russian occupation. A new treaty was concluded by the Porte and the czar Nicholas at Balta Liman in 1849, in consequence of which Sturdza resigned his office, and another boyar, Gregor Ghika, was elected hospodar for seven years. The war of 1853-'6 destroyed the new basis. The Russians again occupied the principalities, but the military events on the Danube and in the Crimea compelled their troops to evacuate them, when they were occupied by the neutral armies of Austria. The peace of Paris in 1856 aggrandized Moldavia with the southernmost portion of Bessarabia, which was detached from Russia, and referred the affairs of the principalities, which were to be united, to a conference at Paris of the representatives of the great powers, the Porte, and Sardinia, which, in August, 1858, finally agreed on a new plan of organization. Soon after Alexander Couza was elected hospodar for life in both principalities, which, being an unexpected event, as two elections were anticipated in accordance with the protocol of the conference, led to new complications. The influence of France prevailed in favor of the tendency to national union, and the election was confirmed by the Porte, and acknowledged by all other parties. In December, 1861, the permanent union of the two principalities, under the title of Roumania, was proclaimed at Bucharest and Jassy. (See ROUMANIA.)

MOLE, the name of many insectivorous mammals of the family *talpidae*, embracing several genera which agree in having a stout, thick, clumsy body, without visible neck, no external ears, minute auditory foramina, very small eyes, short limbs, the anterior much the broadest and largest, with strong claws, short tail, and soft, velvety, and compact fur. Moles are generally distributed over the earth, except in South America and within the tropics, though the genera are closely restricted within certain regions; thus *talpa* is found only in Europe and Asia, *scalops* and *condylura* in North America, *chrysochloris* in Africa, and *urotrichus* in Japan and N. W. America. In *talpa* (Linn.) the dentition is: incisors $\frac{1}{2}$, canines none, and molars $\frac{3}{2}$, the first of the molars representing a canine (the upper in front of the lower), and the last three tuberculate; by some writers the fourth tooth on each side in each jaw is called a canine, which would make the teeth equal in number and alike in kind in both jaws. The nose is lengthened, truncate at the point; feet five-toed, the soles of the fore feet turned backward, with toes connected and strong claws. The European mole (*T. Europæa*, Linn.) is 5 or 6 in. long, with a tail of 1 in.; the fur is blackish and very fine; the bones of the fore limbs are very short and strong, supported by firm clavicles, and ending in a shovel-shaped hand, strengthened by

the elongated falciform carpal bone, armed with large claws, and moved by muscles of great power; the sternum is keeled for the attachment of the pectoral muscles, the prin-



European Mole (*Talpa Europæa*).
a. Fore paw. b. Hind paw. c. Nest.

cipal ones employed in digging their burrows; the muscles of the head are also powerful assistants in loosening the earth as the animal pursues its underground passage, preparing the way by its pointed, movable, hog-like snout. The senses of smell, hearing, and touch are very acute. The eyes are two black glittering points, about the size of mustard seed, concealed and protected by the surrounding skin and hairs. The popular belief that the mole is blind is an error; the mole of Greece mentioned by Aristotle as blind is either the species *T. cæca* (Sav.), in which there is no visible ocular fissure, or perhaps a burrowing rodent or rat-mole (genus *spalax*, Guld.), in which the very small eyes are hidden under the hairy skin. The openings of the ears and mouth may be closed by membranous folds to prevent the entrance of earth; the vent is considerably prolonged upon the tail. Four or five young are produced at a time, twice a year, in spring and autumn. The food consists of worms, insects, and tender roots, in search of which it burrows in the ground; these excavations also serve as places of residence and as highways of travel from one field to another; its abode is in some firm hillock in a secure situation, in which are two circular galleries connected by a chamber excavated in the centre of the lower gallery; these communicate by intricate passages with the high road, through which the animal passes with considerable speed, though very slow-moving on the surface of the ground; the road is placed at a depth of from 4 to 14 in., according to its exposure to pressure from above. The mole frequently comes to the surface to get rid of the loosened earth; it is very voracious, and is soon killed by hunger; it is active all winter, though at a depth of a foot or more, and in summer at night frequently seeks its prey at the surface; it is a good swimmer; when irritated it bites severely, and

the males in the love season often engage in deadly combats. The colors vary; individuals are seen of white, ash, or fawn color. The soft fur is manufactured into light robes and very fine hats, and has been employed for artificial eyebrows. The mole is frequently very detrimental to cultivated lands, but the loss is more than counterbalanced by the destruction of noxious insects and weeds.—The golden moles of Africa (*chrysochloris*, Lacép.) have incisors $\frac{1}{2}$, the middle lower ones small and narrow, and molars $\frac{1}{2}$ — $\frac{1}{4}$; the eyes are covered by skin, nose naked and leathery, fore feet four-toed, with fourth toe very small, hind feet five-toed, and no tail. The best known species (*C. Capensis*, Desm.) is brownish with green and golden reflections; it inhabits the Cape of Good Hope, and has the form, size, and habits of the mole.—The star-nosed mole of North America (*condylura*, Illiger) has the end of the nose surrounded by 22 movable fleshy radiating filaments, which serve as delicate organs of touch; the incisors are $\frac{1}{2}$, the upper middle ones broad, the lower ones procumbent, canines $\frac{1}{2}$ — $\frac{1}{4}$, molars $\frac{1}{2}$ — $\frac{1}{4}$; eyes very small; feet five-toed; tail moderate, thinly haired. The *C. cristata* (Desm.) is about 4 in. long from tip of nose to base of tail, the latter being 3 in. more; it has the general form of the moles; the hands resemble those of terrapins, and with the hind feet (considerably larger) are furnished on both surfaces with a covering of brown scales, with a horny tubercle on the inner edge of the soles; the under surface of the fingers is extended into fringed horny processes. The fur is rather coarse, and sooty brown. It is found in the north-



Star-nosed Mole (*Condylura cristata*).
a. Jaws. b. End of nose.

ern parts of America from the Atlantic to the Pacific.—The most common American moles belong to the genus *scalops* (Cuv.), called also shrew moles from the resemblance of their dentition to that of the shrews; the incisors are $\frac{1}{2}$, canines $\frac{1}{2}$ — $\frac{1}{4}$, molars $\frac{1}{2}$ — $\frac{1}{4}$; in *scapanus* (Pomel), set apart for the Oregon and hairy-tailed moles, the incisors are $\frac{1}{2}$, canines $\frac{1}{2}$ — $\frac{1}{4}$,

and molars $\frac{1}{2}$ — $\frac{1}{4}$. In the common mole (*S. aquaticus*, Cuv.) the teeth are 36, the eyes not covered by integument, tail nearly naked, and feet fully webbed; the color is dark plumbeous, with sometimes a brownish tinge, and the feet and tail are white; it is between 4 and 5



Shrew Mole (*Scalops*).

in. long, with the tail about an inch; it is found from Canada to Florida, and as far west as the Mississippi.—The genus *urotrichus* (Temm.) has incisors $\frac{1}{2}$, canines $\frac{1}{2}$ — $\frac{1}{4}$, and molars $\frac{1}{2}$ — $\frac{1}{4}$; the muzzle is prolonged into a cylindrical tube terminating in a naked bulb; tail short and hairy. A common species in Japan is the *U. talpoides* (Temm.), smaller than the common mole. A species (*U. Gibbsii*, Baird), $2\frac{1}{2}$ in. long, occurs in Washington territory.

MOLE, Louis Mathlen, count, a French statesman, born in Paris, Jan. 24, 1781, died Nov. 23, 1855. His father, president of the parliament of Paris, lost his life during the revolution, and the son passed most of his childhood with his mother in Switzerland and England. Returning to France in 1796, he studied at the central school of public works (now polytechnic school), and in 1806 published his *Essais de morale et de politique*, defending monarchical theories in politics. Napoleon appointed him auditor and soon afterward master of requests in the council of state. In 1807 he was made prefect of the department of Côte-d'Or, subsequently became councillor of state and director general of roads and bridges, and in 1813 received the appointment of *grand-juge* and the titles of count of the empire and commander of the order of *réunion*. While Napoleon was absent with the army, Molé acted as one of the council of regency, and attended the empress in her flight to Blois on the approach of the allied armies in 1814. By advice of the emperor, Molé gave in his adhesion to Louis XVIII., and was called to the municipal council of Paris. On Napoleon's return from Elba, though he refused to sign the declaration of the council of state against the Bourbons, he retained his office of director of roads and bridges, and was made a peer of France. On the second restoration he was renominated to the council of state and con-

firmed in his peerage; but he had little influence in the government. In May, 1817, he became minister of marine in the cabinet of the duke de Richelieu. Resigning in December, 1818, he remained out of office until the accession of Louis Philippe, who appointed him minister of foreign affairs, Aug. 11, 1830. The ministry, consisting of a coalition of parties, held together less than three months; but in September, 1836, Molé became again minister of foreign affairs and premier. He negotiated the marriage of the duke of Orleans, and procured an amnesty for political offenders; but after twice dissolving the chambers, he was forced to resign in March, 1839. In the following year he was chosen a member of the French academy. During the revolution of 1848 he withdrew from public affairs, but without solicitation was chosen to represent the department of Gironde in the constituent assembly, where he placed himself among the leaders of the right. He was a member of the committee which framed the law of 1850 against universal suffrage, and was one of those who protested at the *mairie* of the 10th arrondissement against the *coup d'état* of Dec. 2, 1851. The close of his life was passed at his ancestral château of Champlâtreux. He was one of the staunchest supporters of the Roman Catholic church in France.

MOLE CRICKET, a jumping orthopterous insect, of the genus *gryllotalpa* (Latr.), meaning cricket mole. The European mole cricket (*G. vulgaris*, Latr.) has a most extraordinary and ugly form; it is nearly 2 in. long and $\frac{1}{3}$ of an inch wide, and of a dark brown color; the head, retractile within the prothorax, has two long and strong antennæ in front of its black reticulated eyes; the thorax is elevated and crab-like, covered with a velvety down; the wings, which when expanded are broad and triangular, when folded extend like two ribbons over the abdomen; the abdomen, soft and with nine or ten segments, has two filaments at the end as long as the antennæ; the fore legs are short, broad, and strong, the shanks being very wide, flat, and three-sided, with four finger-like projections on the lower side, giving very much the appearance and the digging powers of the hands of the mole, whence the generic name. It lays 200 or 300 eggs in June in a gourd-shaped hollow in the earth, about 2 in. long, having a winding communication with the surface; the young are hatched in five or six weeks, and resemble black ants, not arriving at maturity till the third year; both young and old commit great ravages by feeding on the tender roots of grass, culinary vegetables, and flowers; they also eat insects and worms, and themselves furnish food for moles, lizards, snakes, and other insectivorous animals. The males emit a pleasing sound at night, at which time they are the most active. Rösel says this insect can push forward on a level surface a weight of 6 lbs. with its fore feet. They rarely appear on the surface, but their presence may

be known by the withered patches in the field and garden, and their retreats detected by the little hills of fresh earth, smaller than those of moles, which they throw up in soft and moist places. Late in autumn they bury themselves deep in the ground, coming again to the surface in the warm days of spring. The surest way to prevent their depredations is to dig up the nests and destroy the eggs; another way is to



Mole Cricket (*Gryllotalpa borealis*).

pour boiling water into their holes. The American species (*G. borealis*) is about 1½ in. long, of a bright bay or fawn color, with the wing covers not half the length of the abdomen, and the tips of the folded wings extending only one third of an inch beyond the covers. The *G. didactyla* (Latr.), having only two finger-like projections on the fore legs, has proved very destructive to the sugar cane in the West Indies and South America.

MOLECULE (Fr. *molécule*, diminutive of Lat. *mole*, a mass), a small mass of matter. The word came into use in France in the early part of the last century, and was adopted by Buffon in describing his remarkable theory of the constitution of organized beings. Later it was used by Laplace in his *Système du monde*, and also by Lavoisier, Fourcroy, and other chemists, at the period of the French revolution. The writers of this period distinguish between *molécules intégrantes* and *molécules constituantes*. By their definitions the former were simply small particles differing from a mass of the same substance only in magnitude; the latter were the more minute particles of the elementary substances, of which the former may be regarded as composed. The *molécules constituantes* corresponded very closely to the atoms of modern chemistry, and by more recent authors the words molecule and atom were frequently used as synonymous. Into the English language the word molecule does not seem to have been readily received. Although the organic molecules of Buffon are referred to by Paley, the word is not found in Johnson's dictionary, and was not generally used by English writers on chemistry and physics until within a few years. Indeed, in England the influence of Dalton's theory has given such authority to the word atom that it is still frequently used to denote both the true chemical atom and the physical molecule, and it is therefore the more important for us to carefully distinguish between them.—The term molecule, as used in the modern schools of physics and chemistry,

implies more than the *molécules intégrantes* of the French writers just referred to. The molecules of a substance are not merely small particles of that substance, but they are isolated masses, or, to use the words of Sir William Thomson, "pieces of matter of measurable dimensions, with shape, motion, and laws of action, intelligible subjects of scientific investigation." The term therefore involves the conception that the molecules of a substance are as definite magnitudes as the stars, and that every mass of matter is a collection of such bodies, just as a stellar cluster is a collection of suns. The molecules of any one substance, however, are supposed to be alike in all respects. There are many phenomena, both of physics and chemistry, which indicate that this conception is just and accurate. We will only refer to two of the most familiar. When by boiling under the atmospheric pressure water changes into steam, it expands, as compared with its volume at the point of maximum density, 1,700 times; or in other words, one cubic inch of water yields nearly one cubic foot of steam. Two suppositions are possible as modes of explaining this change. The first is, that in expanding the material of the water becomes diffused through the cubic foot so as to fill the space with the substance we call water as completely as before, and leaving no space within the cubic foot which does not contain its proper proportion of water. The second is, that the cubic inch of water consists of a certain number of isolated particles, the cubic foot of steam containing the same particles as the cubic inch of water, and the conversion of the one into the other depending simply on the action of heat in separating these particles to a greater distance. Hence the steam is not absolutely homogeneous; for, if we consider spaces sufficiently minute, we can distinguish between such as contain a particle of water and those which lie between the particles. These assumed particles, which are thus supposed to be separated by the heat, are the molecules of the water; and the molecular theory of the constitution of matter explains the change of volume in the manner last described. That this is probably the true explanation will be evident from a consideration of the familiar phenomena which appear when by pressure we condense steam back to water. Conceive of a cylinder filled with rarefied steam at some temperature above the boiling point of water. If into such a cylinder we press a piston, the volume of the steam will be diminished in proportion to the pressure, according to the well known law of Mariotte, up to a certain limit; but as we increase the pressure a point will be reached, sooner or later, at which this law of compression ceases abruptly, and the steam without any intermediate transition takes a volume many hundred times less than before, changing of course into liquid water. Now, if there was a perfect continuity in the steam, we cannot conceive why there should not be a

similar continuity in the law of expansion; and on the other hand, this sudden break is perfectly explained if we are really crowding together a mass of impenetrable particles, and the whole order of the phenomena suggests this conception. Again, if the space occupied by a mass of steam is really packed close with the material we call water, if there is no break in the continuity of this aqueous mass, we should expect that the vapor would fill the space to the exclusion of everything else, or, at least, would fill it with a certain degree of energy which must be overcome before any other vapor could be forced in. But the facts are the very reverse of this. Conceive of two globes at some temperature above the boiling point of water, one filled with steam, the other completely exhausted. Let these globes be so arranged that we can introduce into each the same quantity of alcohol, and we shall find not only that the alcohol will evaporate in both, but that just as much alcohol vapor will form in the globe filled with steam as in the vacuum space, and will exert precisely the same pressure against the sides of the two vessels. The presence of the steam does not interfere in the least degree with the expansion of liquid alcohol into alcohol vapor. The only difference which we observe is that the alcohol expands more slowly into the aqueous vapor than it does into a vacuum. The final result however is the same in both cases, and thus we may have two different vapors filling the same space without interfering with each other; and more than this, so far as we know, any number of vapors, which do not act chemically on each other, may occupy the same space at the same time, each preserving its individuality so completely that its relations would not be essentially altered if the associated materials were removed. Evidently then no vapor completely fills the space which it occupies, although equally distributed through it; and we can give no satisfactory explanation of the phenomena of evaporation except on the assumption that each substance is an aggregate of particles or units, which by the action of heat become so widely separated that they leave very large interstices in which the particles of an almost indefinite number of other vapors can find room.—A study of the phenomena of evaporation leads to a definition of molecules, which, although not comprehensive, is for the cases it covers the most precise that can be given: Molecules are those small particles of a substance which are not subdivided when the body is expanded by heat, and which move as units under the influence of this agent. As the above statement implies, the modern molecular theory assumes, not only that the molecules are isolated masses, but also that they are in active motion, and the phenomena of heat are regarded as manifestations of this motion. The idea that the ultimate particles of matter are in motion is as old as Democritus, but this idea was never precisely formulated

until modern times. Now, however, it is one of the most pregnant theories of science; and it is evident that such motion, if it exists, must be a most important factor in nature. The circumstance that these molecular motions are limited by the boundaries of the mass of matter to which the molecules belong, and that the system remains in equilibrium with relation to external objects, because the amount of motion in opposite directions is usually equal, must not of course affect our estimate of the moving power, and this power is no less than that which would be shown in a motion of translation of the same mass with a velocity equal to the mean velocity of the several molecules; and, since the facts compel us to assign to this velocity a value commensurable with the velocities obtained in artillery practice, it is evident that the total moving power, even in a small mass of matter, must be enormous. There are conditions, however, under which the molecules may communicate their motion to masses and thus produce mechanical effects; and our theory refers the tension of æriform matter, and the mechanical work which it may be made to do, to the bombardment of the sides of the containing vessel by molecular projectiles. In a solid or a liquid it is assumed that the extent of the motion of the molecules is limited by internal forces, but in a gas this motion is supposed to be unrestrained, so that the molecules beat freely against any surface with which the æriform mass may be in contact, and thus the molecules of water in the cylinder of a steam engine produce their well known effects.—The molecular theory has established on a firm foundation the great physical doctrine of the conservation of energy, by explaining a class of phenomena which, as viewed by the old physicists, were apparently wholly at variance with this truth. When two elastic billiard balls strike each other, although the balls may change their velocities, the total moving power will be nearly the same after the collision as before it; but when two inelastic balls of lead strike, there is always an apparent destruction of motion. It was no answer to say that the power which had disappeared as motion had done its work in changing the shape of the balls; for since these bodies cannot recover their figure, and therefore have not the potential energy of elastic bodies under the same conditions, there must be an annihilation of power if the external phenomena are the only effects produced. But if, as our theory assumes, the motion is simply transferred from molar to molecular masses, all is clear; and since we have been able to prove that the change of temperature produced in the masses is the exact mechanical equivalent of the motion lost, we think we are justified in concluding that the effects ascribed to what we call heat are simply manifestations of molecular motion.—When we come to conceive of matter as consisting of elastic molecules

which are ever in motion and colliding with each other, we see that motion must be readily communicated from one part of such a system to another; that any excess of energy acquired by any part must be rapidly dissipated; and that the tendency must be to bring all the molecules to the same condition. Moreover, we see that the motion must spread not only through the molecules of the same body, but also from one body to another; for everywhere in nature the atmosphere or some other medium furnishes lines of molecules along which the energy can pass. Now exactly this is true of heat. When a heated body is brought into a room, the heat immediately begins to spread through surrounding objects, and the process goes on until all are reduced to what we call a uniform temperature, that is, to a condition in which there is no tendency of heat to pass from one to the other; and we must remember that our knowledge of temperature and our means of measuring it depend wholly on this motion of heat. We say that one body has a higher temperature or is hotter than another, if when brought in contact heat passes from the first to the second; and we measure the temperature of a body by bringing in contact with it a thermometer, a small bulb filled with mercury, whose narrow neck enables us to detect the slightest change in the volume of the enclosed liquid. As this volume increases when the mercury is heated, and diminishes when it is cooled, a fixed position of the mercury column indicates that the thermometer is in equilibrium with the body to be tested, and then the artificial scale enables us to compare its thermal condition with freezing and boiling water.—Consider next what must be the mechanical condition of the molecules of two bodies at the same temperature, that is, in thermal equilibrium. The molecular theory assumes that all the molecules of the same substance are alike in every respect, and therefore have the same weight; and hence, in considering the mutual action between different portions of the same substance, we have to deal solely with the collision of small elastic masses of equal weight. Now it follows from the well known laws which govern the collision of elastic bodies, that by the exchanges of velocity which follow each collision the different portions which we are considering would soon be reduced to a state in which the mean velocity of the molecules in each part must be equal. Of course the mutual interchange of velocities must continue after the equilibrium is established, but the loss and gain on either side are then exactly balanced. It follows from this that when two portions of the same substance are in thermal equilibrium, that is, at the same temperature, the molecules of each portion have the same mean velocity. It will be seen however that, although the molecules of a substance in a state of thermal equilibrium have a certain constant mean velocity, the velocity of the individual molecules may vary

very greatly. Indeed, this must result from the fortuitous collisions, which will cause velocity to accumulate sometimes in one molecule and sometimes in another, while contiguous molecules suffer a corresponding loss.—When we come to consider next the mutual action between masses of different substances, consisting therefore of unlike molecules having different weights, the problem becomes more difficult, because we have now to deal with the collisions of unequal masses. Still the same laws as before give us the key to the solution; and it has been shown by Maxwell and Boltzmann that in all cases, when the condition of equilibrium is reached, the mean value of the moving power of the molecules of any masses must be equal. That is, in general, when any two bodies have the same temperature, $\frac{1}{2}mV^2 = \frac{1}{2}m'V'^2$, m and m' representing the weights of the several molecules of the two bodies, while V^2 and V'^2 represent the mean of the squares of the velocities in each system. If the molecular weights are equal, then of course the mean velocities must be equal, as just stated; but if the weights are unequal, then the lighter molecules will have on the average a greater velocity. In any case $V : V' = \sqrt{m'} : \sqrt{m}$; and since we can determine the relative values of the molecular weights, we can calculate the ratio between these mean values of the molecular velocities, assuming of course that the two substances compared are of the same temperature. For example, as the molecules of oxygen gas are 16 times heavier than those of hydrogen gas, the mean value for the velocity of the hydrogen molecules at any given temperature will be four times as great as that for the oxygen molecules. It thus appears that temperature is a condition determined by molecular motion, and that the mean value of $\frac{1}{2}mV^2$ is the same for all bodies at the same temperature, a definite value corresponding to each temperature, and becoming greater or less as the temperature rises or falls. This product is the true measure of temperature, and, as will soon appear, this measure corresponds to that obtained with an air thermometer.—We know as yet but little in regard to the molecular structure either of solids or liquids, but the three great laws which define the ædiform condition of matter may be shown to be necessary consequences of the mode of motion which our theory assigns to the molecules of gases. Gas molecules, as we have seen, move with perfect freedom until their motion is altered by collisions either with each other or against some surface; and our theory refers the pressure of a gas against the surfaces with which it is in contact to a very rapid succession of small impulses which produce the effect of a continuous pressure. Now if a mass of oxygen, for example, is confined in a vessel, each of the oxygen molecules must on an average strike the sides of the vessel the same number of times; and so long as the temperature is constant, it must

strike with an impulse of the same average momentum. Hence each must contribute an equal share to the whole pressure, and this pressure must be proportional to the number of oxygen molecules in the vessel, or in other words to the density of the gas. Next let us assume that we have two similar vessels of equal capacity containing different gases, both at the same temperature and tension, one filled for example with hydrogen and the other with oxygen gas. According to our theory, if the temperatures are the same, the moving power of the hydrogen and oxygen molecules must be the same; that is, $\frac{1}{2}mV^2 = \frac{1}{2}m'V'^2$, as above. Hence $mV : m'V' = V' : V$, or the momentum of the two kinds of molecules, which is the measure of the pressures they exert, must be inversely proportional to their respective velocities. But, on the other hand, the swifter molecules will strike the sides of the vessels a greater number of times in a second, the number of impulses in a given time being proportional to the respective velocities; or $n : n' = V : V'$. Hence, $nmV = n'm'V'$; that is, each molecule of hydrogen will produce in a given time the same effect as each molecule of oxygen, the less momentum being compensated by the greater frequency of the impulses. But if the molecule of hydrogen thus becomes the mechanical equivalent of the molecule of oxygen in producing pressure, then the same effect can be produced in the two vessels only by the same number of molecules. In other words, equal volumes of two gases at the same temperature and tension must contain the same number of molecules; and this is the very important law first announced by Avogadro and afterward confirmed by Ampère.—Next consider what must be the effect on a confined mass of gas of an increase of temperature. Assume that we begin with a closed vessel filled with air at the temperature of melting ice, and with a tension measured by a column of mercury 273 millimetres high in a connecting barometer. An increase of temperature will augment the velocity of the molecule, and the effect of each molecular impulse upon the exposed surface of mercury will be increased in proportion to the velocity; but besides this, each molecule will now strike the mercury a greater number of times in a second, greater again in proportion to its velocity, so that the part of the pressure due to each molecule will vary as the square of the velocity. As the total effect is but the aggregate of these molecular impulses, and the number of molecules acting is assumed to be constant, it is evident that the mercury column, which is the measure of the pressure or tension of this confined gas, must rise in proportion as the product $\frac{1}{2}mV^2$ increases; and since, as we have seen, all gas molecules are mechanically equivalent, the effect must be the same whether our vessel be filled with air or with any other gas. Now this product is our theoretical measure of temperature, and the

assumed apparatus is a possible form of air thermometer, which is the most accurate measure of temperature we employ; and thus it appears that our best practice is in harmony with our theory. Evidently, if we could reduce the temperature of the confined gas indefinitely, we should at last bring the molecules to rest. They would then exert no pressure, and the mercury column in our barometer would fall to its lowest level. This condition would be theoretically the absolute zero, and our air thermometer shows what the relation of this point must be to our ordinary standard of temperature, the centigrade scale.—Beginning with the apparatus in the condition described above, the temperature of the air being that of melting ice or 0°C ., and the tension 273 millimetres, let us heat it to the temperature of boiling water, 100°C . We know by experiment that if the volume of the air is kept constant the mercury column, which measures the tension, would rise to 373 millimetres. Hence, under the conditions assumed and according to our method of graduating thermometers, each centigrade degree corresponds to one millimetre in the height of this mercury column. If the instrument is now cooled through 100°C ., that is, if the temperature is reduced again to 0°C ., the mercury column will of course fall 100 millimetres; and therefore if cooled 373°C ., that is, 273° below the centigrade zero, the tension should become nothing. Or if, according to our mode of estimating temperature by the air thermometer, we define a centigrade degree as a difference of temperature, which at any part of the scale determines in a confined mass of gas a difference of tension equal to $\frac{1}{273}$ of the tension at the temperature of melting ice, then the absolute zero of heat is at -273° on the scale so defined. Such a definition, however, gives us no positive knowledge of the relations of the absolute zero to natural phenomena, as a simple consideration will show.—Starting from the self-evident proposition that the quantity of heat liberated by burning fuel under constant conditions is proportional to the amount of fuel burned, we may use the weight of some combustible of constant nature, like hydrogen, as a measure of quantities of heat. Now taking the case we have assumed of a confined mass of air having a tension of 237 millimetres at the temperature of melting ice, we can say in general that, so far as accurate observations have been made, equal increments of heat measured by the fuel standard cause equal increments of tension, and equal decrements of heat equal decrements of tension. Moreover, it would be possible in a given case to calculate from experimental data, at least approximately, the amount of combustible which would be required to increase the tension of a confined mass of air one millimetre; and the theory of the air thermometer, our standard of temperatures, is based on the conclusion that twice this amount of combustible would increase the tension two milli-

metres, three times the amount three millimetres, and so on. If this is true indefinitely, and if the tension actually increases or diminishes by a constant quantity, through all parts of the scale, on the addition or subtraction of the same quantity of heat (measured by the fuel standard), then we have real knowledge of the relations of the absolute zero. We can say of a mass of matter that it contains as much heat as would be generated by burning a given weight of hydrogen gas, and that if this limited amount of heat were removed its temperature would be reduced to absolute zero. But unfortunately the accurate experiments on the expansion of gases by heat have been confined within such narrow limits of temperature, and our means of connecting the observed effects with the amount of fuel burned, the only legitimate measure of thermal differences, are so indirect, that we must generalize very cautiously; and it is possible that the law to which our observations appear to point would totally fail when the differences of temperature became extreme. Still there are several independent phenomena which seem to confirm this law, and indicate that the absolute zero, as defined above, is a reality and not an assumption. But even as an assumption the absolute zero is on many accounts a more convenient point to count from than the temperature of melting ice. By adding 273° to temperatures expressed in centigrade degrees, we obtain what we may call the absolute temperature; and we find by experiment, as our theory requires, that the tension of a confined mass of any gas is proportional to the absolute temperature thus expressed. This is a modern way of expressing the law discovered by Charles that equal changes of temperature cause the same relative changes of volume or tension in all æriform bodies. Thus it is that the molecular theory explains, and indeed predicts, the mechanical condition of æriform bodies. We have only been able to give the general features of the reasoning. The mathematical demonstration of the several theorems is based on a beautiful application of the doctrine of averages in the calculus of probabilities, and for this we must refer the mathematical reader to the classical works of Clausius.—Let us next consider some of the qualities or relations of molecules of different kinds, which can be deduced by a similar course of reasoning. In the first place, it is evident that if equal volumes of two gases contain the same number of molecules, the relative weights of these molecules must be the same as the relative weights of the equal gas volumes. Thus, a cubic centimetre of oxygen weighs 16 times as much as a cubic centimetre of hydrogen under the same conditions; and if there is in each cubic centimetre the same number of molecules, each molecule of oxygen must weigh 16 times as much as each molecule of hydrogen. In general, the number which expresses the specific gravity of a gas with reference to

hydrogen, expresses also the weight of a molecule of that substance with reference to the hydrogen molecule. It must be remembered moreover that as the molecule of hydrogen is a definite mass, its weight must be a definite quantity, however small, and may therefore be used as a standard of weight like a grain or a gramme. When therefore we determine the specific gravity of a gas with reference to hydrogen, we thereby determine the weight of a molecule of that æriform substance in terms of this molecular unit. For reasons based on chemical relations we have actually adopted as the unit of molecular weight one half of a hydrogen molecule, which we call a hydrogen atom; and hence in the system in use the molecular weight of a substance is equal to twice its specific gravity in the state of gas referred to hydrogen. As this unit of molecular weight, although a magnitude of a very different order, is as definite a mass of matter as a grain or a gramme, we shall aid our conceptions by giving to it a definite name; and since the mass of a cubic decimetre of hydrogen has been called a crith, the word microcrith will suggest both the nature of the molecular unit and the order of its magnitude. Remembering then that the microcrith is the weight of the hydrogen atom, and that this is one half of the hydrogen molecule, we shall be understood when for the future we estimate molecular weights in microcriths. In the second place, it is evident that the known pressure which a gas exerts against the sides of the containing vessel gives data from which we can calculate the mean velocity of the molecular motion under determinate conditions. Consider for example a cubic metre of hydrogen gas at the temperature of melting ice and under a pressure of one atmosphere. This æriform mass weighs 0.08954 of a kilogramme, and exerts a pressure of 10,332.96 kilogrammes against each face of the cubic enclosure. This pressure balances the molecular bombardment, and the momentum of the bombardment thus resisted during one second must be equal to that which the pressure would produce during the same period if acting on a mass of matter free to move. If the force of gravity at the place of observation imparts to one kilogramme of matter a velocity of 9.8088 metres a second, then this momentum must be equal to $9.8088 \times 10,332.96 = 101,354$. To find the momentum of the molecular bombardment against the cube face, we must conceive of the mass of hydrogen divided by planes parallel to the face in question into very thin sections, which are not thicker than the length of the mean path of a molecule, and between which the motion may be regarded as uniform. Let V represent the mean velocity of the molecules, moving of course in all directions, and u one of the components of this velocity resolved perpendicularly to the face of the cube we are considering, and estimated of course as so many metres a second. Limiting our attention to this compo-

nent, it is evident that we may regard the whole number of the hydrogen molecules within the enclosure as moving at any instant with the mean velocity u on lines normal to the face of the cube we are considering, and directed either toward this face or its opposite; and, since equilibrium is maintained, it is evident that the two opposite molecular volleys must be equal to each other. It is also further evident that the pressure against the face of the cube must be the sum of these two molecular streams, that from the face as well as that toward it. If the molecules moved only one metre each second, it is manifest that each molecule would on the average move through the length of the cube in a second, were it not that the direction of its motion is continually being altered by collision with other molecules. But although the path of any one molecule may be very short, yet, as the molecules perfectly transmit their motion at each collision, and as the motion is always carried forward by a series of perfectly similar masses, the result is the same as if the same one had moved through the whole distance. There is therefore constantly passing between the small sections we have assumed, and also beating against the opposite faces of the cube, the same number of molecules as if the two streams were continuous. If the velocity were only a metre a second, there must pass every section in one or the other direction, and beat against one or the other of the two opposite faces of the cube during each second, a number of molecules, which we will represent by n , equal to the whole number of molecules in the cube; and since the velocity we are considering is u , the number of molecules thus passing on striking must be nu . If now m represents the weight of each molecule, then the total momentum resisted by the cube face each second must be $mn u^2$, which is equal, as we have before seen, to 101,354. But in the expression $mn u^2 = 101,354$ the value mn is simply the weight of the cubic metre of hydrogen at the temperature of melting ice and at a pressure of one atmosphere, or 0.08954 of a kilogramme; so that $u^2 = 101,354 \div 0.08954 = 1,131,940$. It must be remembered, however, that u is only one of the components of the molecular velocity, that perpendicular to one pair of the cube faces; and in order to determine the actual velocity, V , we must take into consideration the other two components, which are normal to the other two pairs of the cube faces; for $V^2 = u^2 + v^2 + w^2$. Now, although the values of these components for individual molecules may vary between the widest limits, yet their average values must be equal; for otherwise the pressure of the gas could not be, as it is, equal in the directions of these components. If then our letters represent these average values, $V^2 = 3u^2 = 3,395,820$, and $V = 1,843$ metres a second. The absolute velocity of the hydrogen molecules being now known at the temperature of melting ice, we can readily calculate

the velocity for any other temperature. For if the temperatures are estimated on the absolute scale, we have, as has been shown, $T : T' = \frac{1}{2}mV^2 : \frac{1}{2}mV'^2$, and hence $V : V' = \sqrt{T} : \sqrt{T'}$. For example, the velocity of the hydrogen molecules at the temperature of boiling water would be found by the proportion $1,843 : V' = \sqrt{273} : \sqrt{373}$. Knowing now the velocity of the hydrogen molecule at any temperature, we can find the velocity of every other molecule whose molecular weight is known. Since for any given temperature $\frac{1}{2}mV^2 = \frac{1}{2}m'V'^2$, we have $V : V' = \sqrt{m'} : \sqrt{m}$. For the oxygen molecules which weigh 32 microcriths we have at the temperature of melting ice $1,843 : V' = \sqrt{32} : \sqrt{2}$, and $V' = 461$ metres a second. The velocity of the molecules of the heavier gases is still less, but in all cases it is very great as compared with that obtained with projectiles. —The weight and velocity of the molecules of different gases are known with great precision, because the data from which they have been calculated are very well determined. But the molecular relations we have next to consider cannot be ascertained with the same accuracy, and must be regarded as only rough approximations. Moreover, the methods by which they have been calculated cannot be described in a few words, and we can therefore only state here the general results. As we have shown, the molecules of a gas are flying about in all directions with great velocity; those of the air, for example, about 17 miles a minute. Could we by any means turn into one direction the actual motion in the molecules of what we call still air, this air would at once become a wind blowing 17 miles a minute, and exerting a destructive power compared with which that of the most violent tornado is feeble. We are unconscious of the molecular storm which is constantly beating around us only because it beats equally in all directions at once. Obviously, however, an immense number of small masses of matter cannot be flying in every possible direction without constantly striking each other, and every time two molecules come into collision the paths of both are changed, and frequently reversed; so that although they move with such great velocity they make very slow progress. When a jar of ammonia gas, for example, is opened in a lecture room, a sensible time elapses before its pungent odor is perceived even at a distance of a few feet, and a long time passes before it reaches the distant end of the hall. Nevertheless, the molecules of ammonia at the ordinary temperature move over 20 miles a minute, and would flash over the hall were they not jostled about by the molecules of air. Still, although the process is a slow one, the gas does diffuse itself through the air, and we can easily devise experiments to test the rate of progress. The phenomena of which our illustration is a single example are among the most instructive effects of molecular motion, and under the name diffusion of gases they have long been studied.

It was discovered by the late Dr. Graham that two gases diffuse through each other at rates which are inversely proportional to the square roots of their densities, and this empirical law strongly confirms the molecular theory; for, as we have seen, the molecular velocities, which must determine the relative rates of diffusion, are also proportional to the square roots of the densities. More recently the diffusion of gases has been studied by Loschmidt of Vienna, who measured the absolute as well as the relative rates. He placed the two gases in similar portions of the same vertical tube, the lighter over the heavier, and after allowing them to diffuse during an observed time closed a sliding valve which divided the two portions, and then by chemical analysis determined the amount of gas which had passed in the two directions. According to our theory, the molecules of still air must also travel from place to place in the same halting manner as the gases; only we have not the means of noting their progress. Nevertheless, by communicating momentum or heat to one portion of a mass of air, under such conditions as to avoid the effect of currents, and observing the rates at which the momentum or heat spread by means of phenomena depending on these effects, we obtain data by which we can estimate approximately the travelling power of the molecules. Such phenomena depend on modes of diffusion, and Maxwell distinguishes between what he terms the diffusion of mass, the diffusion of momentum, and the diffusion of energy. Taking then into consideration the obvious principle that the greater the velocity of the molecules and the longer their path between successive collisions the faster they must travel, and remembering that we know the velocity of their actual motion, it can readily be seen that experiments on the three kinds of diffusion would give us the means of calculating what Clausius calls the mean path of a molecule, that is, the average distance travelled by a molecule between one collision and another; and further, that from the velocity and mean path we can estimate the number of collisions in a second. Of course the mean path varies for different molecules and under different conditions. That these paths should be very short we should expect, but our calculations surprise us by showing that they are of the same order of magnitude as the waves of light, and that the number of collisions in a second is to be numbered by thousands of millions. No wonder that although the molecules move so swiftly, they make so little progress. —As has already been said, the phenomena attending the condensation of a gas to a liquid have the appearance of the crowding together of hard masses, and suggest the conception that in the liquid state the molecules are as near together as when they come into collision in the state of gas. If this conception is accurate, the specific gravity of a liquid is the specific gravity of its molecules, and the diameter of a molecule is the distance between

the centres of two adjacent masses in the liquid state. It is generally assumed that the perfect elasticity of the molecules results from an elastic atmosphere, perhaps the ether, which surrounds them, and in a gas we distinguish between what we call the free path of the molecule and that portion of its motion during which the path is changed by collision; and the principal difference between a gas and a liquid seems to be, that while in a gas the molecules are almost all the time on the wing, in a liquid they are always in a state of close encounter with each other, and have hardly any free path. When therefore we define the diameter of a molecule as the distance between the centres of two adjacent molecules in the liquid state, we of course include the molecular atmosphere, or at least so much of it as produces an appreciable effect in the collision. If then we thus define the diameter of a molecule, it is evident that we can determine the relative diameters of molecules of different substances by comparing their densities in the æiform and liquid states. For the densities of the gases give us the relative weights of these molecules, and the densities of the liquids the weights of the unit volume of the liquids. Hence, by dividing the latter by the former, we learn the relative number of molecules in these equal volumes, and from this we at once deduce the relative volumes of the molecules and their relative diameters. Moreover, as these results agree very remarkably with those obtained by other means, we feel great confidence in the assumption on which they are based; and if our knowledge in regard to them is not precise, it is at least approximate.—We next come to a class of molecular data of which our knowledge is not only not precise, but not even definite, and whose assigned values can only be regarded as probable conjectures. Loschmidt has deduced from the principles of molecular mechanics the following theorem: "As the volume of a gas is to the combined volume of all the molecules contained in it, so is the mean path of a molecule to one eighth of its diameter." Since we know at least approximately the other three quantities, we ought to be able by this proportion to calculate the absolute molecular diameters. Accordingly, Maxwell has calculated from Loschmidt's data that "the size of the molecules of hydrogen is such that two million of them in a row would occupy a millimetre, and a million million million million of them would weigh between four and five grammes;" and further, that "in a cubic centimetre of any gas at standard pressure and temperature there are about 19 million million million molecules." Striking as these results are, they depend on so many uncertain elements that they must be accepted with caution. Still it should be added that from several wholly independent data, such as the lengths of luminous waves, the thickness of soap bubbles, and the electric properties of metals, Sir William

Thomson has deduced values of the molecular magnitudes which are consistent with the numbers just given, and has proved that these magnitudes must fall within certain limits, which, though too wide to secure entire confidence in his methods, at least fix the order of the magnitudes.—In preparing this article we have been greatly indebted to the lecture on molecules delivered before the British association at Bradford in September, 1873, by Prof. Maxwell, and to sum up what we have said of the physical relations of molecules we reproduce from this lecture the table of molecular magnitudes, in which the values are classed according to the completeness of our knowledge in regard to them:

TABLE OF MOLECULAR DATA.

	RANK I.			
	H-H	O=O	C=O	C≡O ₂
Mass of molecule, in microcriths.....	2	32	28	44
Velocity at 0° C. (from mean square), in metres a second.....	1859	465	497	396
	RANK II.			
Mean path, in (10) ⁻¹⁰ of a metre.....	965	560	482	879
Collisions in a second, in millions.....	17750	7646	9489	9720
	RANK III.			
Diameter, in (10) ⁻¹⁰ metres.....	5·8	7·6	8·8	9·8
Mass, in (10) ⁻³⁶ of a gramme.....	46	736	644	1012
Number of molecules in one cubic centimetre of any gas under normal conditions.....	19 million	million	millions, or 19 × 10 ¹⁸ ,	

"These considerations will show how definite the idea of the molecule has become in the mind of the physicist. It is no longer a metaphysical abstraction, but a reality about which he reasons as confidently and as successfully as he does about the planets. He no longer connects with this term the ideas of infinite hardness, absolute rigidity, and other incredible assumptions which have brought the idea of a limited divisibility into disrepute. His molecules are definite masses of matter, exceedingly small but still not immeasurable; and they are the points of application to which he traces the action of the forces with which he has to deal. These molecules are to the physicist real magnitudes, which are no further removed from our ordinary experience on the one side than are the magnitudes of astronomy on the other. The old metaphysical question in regard to the infinite divisibility of matter, which was such a subject of controversy in the last century, has nothing to do with the present conception. Were we small enough to be able to grasp the molecules, we might be able to split them, and so were we large enough we might be able to crack the earth; but we have made sufficient advance since the days of the old controversy to know that questions of this sort, in the present state of knowledge, are both irrelevant and absurd. The geologist

tears the earth to pieces, and so does the chemist deal with the molecules; but to the astronomer the earth is a unit, and so is the molecule to the physicist. The word molecule, which means simply a small mass of matter, expresses our modern conception far better than the old word atom, which is derived from the Greek *a* privative and *τέμνω*, and means therefore indivisible. In the paper just referred to, Sir W. Thomson used the word atom in the sense of molecule, and this confusion of the two terms is still common. We shall give to the word atom an utterly different signification, which we must be careful not to confound with that of molecule. In our modern chemistry the two terms stand for wholly different ideas, and, as we shall see, the atom is the unit of the chemist in the same sense that the molecule is the unit of the physicist." (The writer of this article, in "The New Chemistry," page 35, New York, 1874.)—The chemist studies the molecular theory from a point of view quite different from that of the physicist. To the physicist the molecules are the points of application of those forces which determine or modify the physical condition of bodies, and he defines molecules as the small particles of matter which under the influence of these forces act as units. To the chemist, on the other hand, the molecules determine those differences which distinguish substances. Sugar, for example, has the qualities which we associate with that name, because it is an aggregate of molecules which have those qualities. Divide up a lump of sugar as small as you please: the smallest mass that you can recognize still has the qualities of sugar; and so it must be if you continue the division down to the molecules; and so is it with every substance. It is the molecules in which the qualities inhere. Hence the chemist's definition of a molecule: The smallest particles of a substance in which its qualities inhere. By no physical process, that is, by no process which leaves the qualities of a substance essentially unchanged, is subdivision carried beyond the molecules. The molecules can however be divided, but by the division you destroy the substance; new substances result, and you have what is called a chemical process. The distinguishing feature of a chemical change is simply this: From one or more substances one or more new substances are produced, and according to the molecular theory these changes depend on the reciprocal action of different kinds of molecules on each other. The molecules become subdivided, and new molecules are formed by a new grouping of the fragments. And here chemistry comes in to substantiate the molecular theory with most important evidence. If in a chemical change the reaction takes place between molecules, then we should expect that the weights of the substances involved in the process would bear some simple relation to the weights of their molecules, as determined by physical

methods. Now this is exactly what we find to be true. It is the great law of chemistry that in every chemical process definite proportions are preserved between the weights both of the factors and of the products of the change; and wherever observation is possible it has been found that these weights bear a simple relation to the specific gravities of the substances in the state of gas, which, as will be remembered, are the measures of the molecular weights of these substances. A few examples will illustrate this point. When hydrochloric acid gas combines with ammonia to form ammoniac chloride (sal ammoniac), 36.5 parts by weight of the former unite with 17 parts of the latter. Now the specific gravities of these two gases with reference to hydrogen are by observation 18.32 and 8.53 respectively, and the molecular weights 36.5 and 17 microciths, very nearly. When water is decomposed, 9 parts by weight of water yield 8 parts of oxygen gas and 1 part of hydrogen. The specific gravities of the several substances in the state of gas are (by observation) 8.98, 15.95, and 1, and the weights of the molecules therefore 18, 32, and 2 microciths, very nearly. Examples like these might be multiplied indefinitely. The relation is very simple. The chemical proportions are always very nearly either as the molecular weights, deduced from the gas densities, or as some simple whole multiples of these weights; a fact which wonderfully confirms the molecular theory.—But it may be asked, why is not the relation just described absolute? First, because a certain amount of error of observation is inherent in all measurement, and the determinations of gas densities are peculiarly exposed to errors of this kind; and secondly, and chiefly, because the vapors, on which we mostly experiment, are not in the condition of perfect gases. They do not perfectly obey the law of Mariotte, and, as the molecular theory shows, it is only when they exactly obey this law that they contain the same number of molecules in the unit volume, and that their densities are the measures of their molecular weights. In the case of a few perfect gases the agreement between the two classes of observations is very close; but with most vapors, especially when near the point of condensation to liquids, we can only expect to find an approximation. It is evident moreover that the definite proportions of chemistry, which can be weighed with the greatest accuracy, are a far more exact measure of the molecular weights than the gas densities. Of course we cannot tell from these proportions alone whether they are the ratios between the weights of equal or of multiple numbers of molecules; but here the gas densities come to our aid, and fix approximately the values of the molecular weights, which we need only correct by the chemical evidence. When, as is most frequently the case, the substances with which we are dealing are incapable of existing in the state of gas, we

are obliged to depend wholly on the combining proportions for fixing their molecular weights; but although in such cases we have various chemical means of controlling our results, we are frequently in danger of assigning multiple values.—Chemistry has shown that all matter is composed of one or more of 64 substances, which we call elementary substances or chemical elements, because as yet they have not been decomposed; and by the processes of chemical analysis we are able to determine with great accuracy the relative proportions of each element which a compound may contain. Moreover, as the masses are aggregates of perfectly similar molecules, it is evident that in analyzing a substance we analyze also its molecules; and that when we learn, for example, that water, in every hundred parts, contains 88·89 parts of oxygen and 11·11 parts of hydrogen, we know that every molecule of water must consist of the same elements in the same proportions. The following tables contain lists of volatile compounds of four elementary substances. Opposite to the name of each substance is, first, the weight of its molecule in microcriths, and secondly, the amount in each molecule of the elementary substance common to the list. The molecular weights are deduced primarily from the gas or vapor densities, but are corrected by the known combining proportions of the compounds. The amount of the elementary substance which each molecule contains is calculated from the results of chemical analysis.

Atomic Weight of Carbon.

NAMES OF COMPOUNDS OF CARBON.	Weight of molecule.	Weight of carbon in molecule.
Marsh gas.....	16 m.c.	12 m.c.
Olefiant gas.....	23 "	24 "
Propylic alcohol.....	60 "	36 "
Ether.....	74 "	48 "
Amylic alcohol.....	88 "	60 "
Triethylstibine.....	209 "	72 "
Toluol.....	98 "	84 "
Oil of wintergreen.....	152 "	96 "
Cumole.....	120 "	108 "
Oil of turpentine.....	186 "	120 "
Amyl benzole.....	143 "	132 "
Diphenylamine.....	169 "	144 "

Atomic Weight of Hydrogen.

NAMES OF COMPOUNDS OF HYDROGEN.	Weight of molecule.	Weight of hydrogen in molecule.
Hydrochloric acid.....	36·5 m.c.	1 m.c.
Hydrobromic acid.....	81 "	1 "
Hydroiodic acid.....	128 "	1 "
Hydrocyanic acid.....	27 "	1 "
Water.....	18 "	2 "
Hydric sulphide.....	34 "	2 "
Hydric selenide.....	81·5 "	2 "
Formic acid.....	46 "	2 "
Ammonia gas.....	17 "	3 "
Hydric phosphide.....	34 "	8 "
Hydric arsenide.....	78 "	8 "
Acetic acid.....	60 "	4 "
Olefiant gas.....	23 "	4 "
Marsh gas.....	16 "	4 "
Alcohol.....	46 "	6 "
Ether.....	74 "	10 "
Hydrogen gas.....	2 "	2 "

Atomic Weight of Oxygen.

NAMES OF COMPOUNDS OF OXYGEN.	Weight of molecule.	Weight of oxygen in molecule.
Water.....	18 m.c.	16 m.c.
Carbonic oxide.....	28 "	16 "
Nitric oxide.....	30 "	16 "
Alcohol.....	46 "	16 "
Ether.....	74 "	16 "
Carbonic dioxide.....	44 "	32 "
Nitric dioxide.....	46 "	32 "
Sulphurous dioxide.....	64 "	32 "
Acetic acid.....	60 "	48 "
Sulphuric trioxide.....	80 "	48 "
Methyllic borate.....	104 "	48 "
Ethyllic borate.....	146 "	48 "
Ethyllic silicate.....	208 "	64 "
Osmic tetroxide.....	268·2 "	64 "
Oxygen gas.....	32 "	32 "

Atomic Weight of Chlorine.

NAMES OF COMPOUNDS OF CHLORINE.	Weight of molecule.	Weight of chlorine in molecule.
Hydrochloric acid.....	36·5 m.c.	35·5 m.c.
Acetylic chloride.....	79·5 "	35·5 "
Ethyllic chloride.....	64·5 "	35·5 "
Phosgene gas.....	99 "	71 "
Dicarbonic dichloride.....	95 "	71 "
Chromic oxychloride.....	153·2 "	71 "
Arsenious chloride.....	181·5 "	106·5 "
Boric chloride.....	117·5 "	106·5 "
Phosphorous chloride.....	187·5 "	106·5 "
Carbonic tetrachloride.....	184 "	142 "
Dicarbonic tetrachloride.....	166 "	142 "
Sillicic chloride.....	170 "	142 "
Tantallic chloride.....	359·4 "	177·5 "
Columbic chloride.....	271·4 "	177·5 "
Aluminic chloride.....	267·8 "	218 "
Dicarbonic hexachloride.....	237 "	218 "
Chlorine gas.....	71 "	71 "

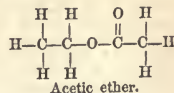
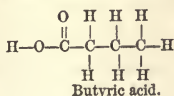
An inspection of these tables will reveal one of the most remarkable facts in the whole range of physical science. The molecules of the compounds of any element always contain quantities of that element, which are simple whole multiples of a definite mass; and this mass, which is the smallest quantity of an element found in the molecules of any of its compounds, is what we call the atom of that element. Thus the atoms of the four elements oxygen, chlorine, carbon, and hydrogen weigh respectively 16, 35·5, 12, and 1 microcriths respectively. It will be noticed that this definition does not necessarily imply that the atoms are isolated masses like the molecules. When water is decomposed, two substances, which we call oxygen and hydrogen, are evolved from the aqueous mass, and from each molecule of water there must be evolved by the chemical processes the quantities of these elementary substances which we call one atom of oxygen and two atoms of hydrogen. Whether now these masses preëxisted in the molecule, or are formed from it by some unknown and unconceived transformation of its substance, is a question about which we can only speculate. Nevertheless these atoms are definite and invariable quantities whether preëxisting as isolated masses in the molecules or not; and the only theory which has been advanced that gives an intelligible explanation of the facts

assumes that the atoms are not only invariable quantities, but definite bodies, and that the molecules are congeries of atoms, except, of course, in those cases where the molecules consist of a single atom. The atom is the unit of the chemist in the same sense that the molecule is the unit of the physicist; and as the molecules are the limits which the subdivision of matter reaches in any physical process, so what we now regard as atoms are the limits of the subdivision in any known chemical process. The word atom, by which we designate these units of chemistry and which we have inherited from the past, is in some respects an unfortunate term, because its etymology suggests conceptions which are no longer associated with the small masses it designates. Although our chemical atoms have never as yet been divided, we do not regard them as necessarily indivisible. The atom of oxygen for example, weighing 16 microcriths, is simply the smallest quantity of this elementary substance known to exist in a molecule of any of its compounds. It is by no means impossible that a compound of oxygen may be discovered whose molecule contains only 8 microcriths of the element; or in other words, that what we now call an oxygen atom may be divided, just as it is possible that the elementary substance may be decomposed; for the chemical atom, like the chemical element, is such only provisionally.—The distinction between atom and molecule is preserved in chemistry by the system of chemical symbols. The Latin initials which are used as the symbols of the chemical elements represent in every case one atom of the elementary substance, and the groups of these letters which are used as the symbols of chemical compounds stand in each case for one molecule of the compound. Thus O stands for one atom or 16 microcriths of oxygen, C for one atom or 12 microcriths of carbon, and H for one atom or one microcrith of hydrogen; H_2O for one molecule of water, $\text{C}_2\text{H}_5\text{O}$ for one molecule of alcohol, $\text{C}_2\text{H}_3\text{O}_2$ for one molecule of acetic acid. The figures below the symbol indicate the number of atoms of the corresponding element in the molecule, and the weight of the molecule is obviously the sum of the weights of the atoms which the symbols represent. For example, the weights of the molecules of water, alcohol, and acetic acid are 18, 46, and 60 microcriths respectively. Several molecules of a compound may be indicated by placing figures before the group of symbols like an algebraic coefficient; thus $3\text{H}_2\text{O}$ stands for three molecules of water, and $4\text{C}_2\text{H}_3\text{O}_2$ for four molecules of acetic acid. In order to determine the symbol of a molecule, we must know in the first place the molecular weight, and in the second place the percentage of composition. The molecular weight, as we have seen, is found approximately from the gas or vapor density, and corrected by the combining proportions of the substance. The percentage

composition is determined by a quantitative chemical analysis. As an example, suppose we wished to determine the symbol of butyric acid. The specific gravity of the vapor of this volatile compound was determined by Cahours and found to be 44.3, hydrogen gas being unity. Hence the molecular weight would be 88.6 microcriths, but the combining proportions of the acid deduced from analyses of its salts prove that the more accurate value is 88 m. c. An analysis of the acid published by Grönzweig gives the following percentage composition, and from this we easily calculate the amount of each element in 88 m. c. or one molecule:

ELEMENTS.	Analysis of butyric acid.	Composition of one molecule.	Atomic weight.	Number of atoms in one molecule.
Carbon....	54.51	47.97 m. c. =	12 ×	4
Hydrogen...	9.26	8.15 " =	1 ×	8
Oxygen....	86.23	81.68 " =	16 ×	2
	100.00	88 "		

Evidently in the molecule there are 4 atoms of carbon, 8 atoms of hydrogen, and 2 atoms of oxygen, and the symbol is therefore $\text{C}_4\text{H}_8\text{O}_2$. Thus we can fix the symbols of all volatile bodies. If the substance is non-volatile, we rely primarily on the combining proportion to fix the molecular weight, and, as has been said, there is frequently danger of assigning multiple values. But as a general rule the chemical relations of the substance enable us to determine which of the possible multiples should be taken; and if these leave us in doubt, we adopt provisionally as the symbol of the molecule that multiple which has the smallest number of whole atoms, and wait for the progress of science to correct any error. But even after weighing the molecules and determining the number and kind of atoms of which they consist, chemistry has gone forward still further in developing the molecular theory, and has discovered a large and important class of phenomena, which it refers to differences of arrangement in the grouping of the atoms of the molecules. Thus, there is a substance called acetic ether which has the same molecular weight and the same percentage of composition as butyric acid. Its molecules therefore contain the same number of the same kind of atoms as the other. Yet the qualities of the two substances are utterly different, the acid having the disgusting smell of rancid butter and the ether the pleasant odor of apples, and chemistry attempts to explain this difference by showing that the atoms are arranged differently in the two classes of molecules, as the following diagrams indicate:



Substances so related are said to be isomeric, and these structural formulas, as they are called, so far from being vagaries of the imagination, are sober deductions from experimental evidence. It is impossible however, in a brief article, to render this evidence intelligible. The investigation of molecular structure is at present the chief aim of chemistry, and to works on this subject the reader is referred for further information.

MOLENBEEK-ST.-JEAN, a town of Belgium, adjoining Brussels and forming one of its suburbs; pop. in 1871, 80,974 (in 1846, 12,065). It has a celebrated geographical institution and a museum of natural science belonging to Messrs. Van der Maalen.

MOLESCHOTT, **Jacob**, a German physiologist, born in Bois-le-Duc, Holland, Aug. 9, 1822. He took his degree at Heidelberg in 1845, practised medicine at Utrecht till 1847, and afterward lectured at the university of Heidelberg till 1854, when, having been accused of pantheism and of propounding precepts dangerous to religion and morals, he resigned. He accepted in 1856 a professorship in Zürich, and in 1861 the chair of physiology in Turin. His doctrine has been popularly described as based upon the German saying that *Der Mensch ist was er isst* (man is what he eats), or upon his own formula, *Ohne Phosphorus kein Gedanke* (no thought without phosphorus); and though he does not deny the existence of a spiritual life, he connects the origin of all species of animals with physical laws alone. His influence has greatly promoted the study of physiology and anthropology, and he has given especial attention to food and diet, the liver, the blood, milk, the origin of bile, and the structure of the muscles. His principal works are: *Lehre der Nahrungsmittel* (Erlangen, 1850; 3d ed., 1858; English translation, "The Chemistry of Food and Diet," by Dr. E. Bonner, London, 1856); *Physiologie der Nahrungsmittel* (Darmstadt, 1850; 2d ed., Giessen, 1859); *Der Kreislauf des Lebens* (Mentz, 1852; 4th ed., 1863); *Georg Forster* (Frankfort, 1854; 2d ed., 1862); *Ursache und Wirkung in der Lehre vom Leben* (Giessen, 1867); and *Von der Selbstbestimmung im Leben der Menschheit* (1871).

MOLESWORTH, **William Nassau**, an English author, born at Millbrook, near Southampton, Nov. 8, 1816. He graduated at Cambridge, and in 1841 became incumbent of a church at Manchester, and in 1844 vicar at Rochdale. His works include "A History of the Reform Bill of 1832" (London, 1864); "A New System of Moral Philosophy," and a "Prize Essay on Education" (1867); and "The History of England, from the Year 1830" (3 vols., London, 1871-'4).

MOLFETTA (anc. *Respa*), a fortified seaport town of S. Italy, on the Adriatic, in the province and 16 m. W. N. W. of the city of Bari; pop. in 1871, 26,829. It is the see of a bishop, and has a cathedral, several other churches, a college, a museum, and a castle. Linen and

saltpetre are manufactured, and small coasting vessels are built. In the vicinity are numerous oval caverns arranged in tiers, one of which, called the Pulo di Molfetta, is upward of 1,000 ft. in circumference and 100 ft. deep. Nitre abounds in all the caverns, and is largely extracted.

MOLIÈRE, the assumed name of **JEAN BAPTISTE POQUELIN**, a French dramatist, born in Paris, Jan. 15, 1622, died there, Feb. 17, 1673. He was both the son and grandson of *valets de chambre tapissiers* to the king, and was himself destined for this trade. His grandfather occasionally took him to the hôtel de Bourgogne, where Bellerose then acted in genteel comedy, and Gauthier-Garguille and Turlupin in farce. Obtaining permission to engage in study, he went in 1637 to the Jesuit college of Clermont in Paris, where he remained five years. He enjoyed the private lessons of Gassendi, and was associated with the prince of Conti, afterward his patron and friend, Bernier, Hesnault, and Chapelle. He studied law at Orleans, and was admitted an advocate in 1645; but his taste for the stage caused his return to Paris. The attractions of the actress Madeleine Béjart were reported also to have influenced his judgment. The example of Richelieu had created a general interest in the drama, and Poquelin became the head of a troupe of amateur comedians, which was soon transformed into a regular professional travelling company, known as *l'illustre théâtre*. He then assumed the name of Molière. Little is known of his life in the provinces from 1646 to 1658, when he returned to Paris. He composed numerous imitations of Italian farces, some of which were the first sketches of his future comedies. At Bordeaux he was welcomed by the duke d'Épernon; at Lyons he obtained the accession of Mme. Duparc and Mme. de Brie to his company, which already included the brothers and sister Béjart; and at Pezénas he was accustomed to sit every Saturday in a barber's shop to study the faces and conversation of the visitors. His first regular comedy was *L'Étourdi*, represented at Lyons in 1653, which by its success induced the principal members of a rival company to join his troupe. After visiting the chief cities of the south, he entered the capital under the protection of Monsieur, duke of Orleans. His performance of his own *Docteur amoureux* before the court and the comedians of the hôtel de Bourgogne was so satisfactory that his company was permitted to establish itself in Paris under the name of the *troupe de Monsieur*. It became the *troupe du roi* in 1665, and subsequently was united with that of the hôtel de Bourgogne to form the Théâtre Français. During the last 15 years of his life he produced more than 30 plays, half of which are masterpieces. He opened a new path in 1659 by his *Précieuses ridicules*, abandoning the traditions of the Italian and Spanish stage, and assailing the affectations encouraged in literature and soci-

ety by coteries that ridiculously adopted the tone of the hôtel de Rambouillet. The play had a run of four months. At brief intervals followed *Sganarelle, ou le cocu imaginaire* (1660), a somewhat scandalous farce; *Don Garcie de Navarre* (1661), which failed; *L'École des maris* (1661), in which the leading idea is borrowed from the *Adelphi* of Terence, and the character of Sganarelle attains its fullest development; and *Les fâcheux* (1661), the first and one of the finest examples of a *comédie à tiroirs*, designed to be acted in the intervals of a ballet. In 1662 he married Armande Béjart (a sister of the actress in his company), whom the slanders of the time charged with being a daughter of his former mistress. This has been completely disproved by legal documents brought to light in 1821. His three next plays, *L'École des femmes* (1662), *La critique de l'École des femmes* (1663), and *L'Impromptu de Versailles* (1663), increased the animosity against him. The first and second aroused the suspicions of the religious party, and the third drew upon him the unscrupulous assaults of the rival troupe at the hôtel de Bourgogne. In 1664, at the brilliant fêtes of Versailles, Molière and his company contributed to the gayeties on four of the seven days. He presented *La princesse d'Élide*, a romantic and gorgeous play, and the first three acts of *Tartufe*, a satire on hypocrites, the success of which when completed was greatly increased by the king's forbidding its representation in Paris. He treated a kindred topic in the comedy of *Le festin de pierre* (1665), which portrays the multiple character of Don Juan. This was preceded by *Le mariage forcé*, directed against the theologians of the Sorbonne, and followed by *L'Amour médecin*, which began the war with the medical faculty continued by Molière through life. Within the next three years followed *Le misanthrope*, which Frenchmen pronounce his *chef d'œuvre*, partly from its faultlessness of style, and partly from its portrayments of Alceste, who runs counter to the conventional hypocrisies of social intercourse, and of Célimène the coquette and Arsinoë the prude; *Le médecin malgré lui*, a rollicking farce, which had the greatest success; *Amphitryon*, an imitation of Plautus; *L'Avare*, exhibiting in the character of Harpagon the comical relations of avarice; and *Georges Dandin*, designed to expose the mischief resulting from ill-assorted marriages. His *Tartufe*, the greatest effort of his genius, was also once acted with signal applause at the Palais Royal, but its second representation was immediately forbidden, and within a week the archbishop had threatened excommunication against all who should act, read, or listen to it. In the period between the performance of *Tartufe* in Paris and the death of Molière, the less important pieces which he successively produced were the farce of *Monsieur de Pourceaugnac*; the *Amants magnifiques*, in which astrology is satirized;

the *Fourberies de Scapin*; and *La comtesse d'Escarbagnas*. To this period belong *Le bourgeois gentilhomme* (1670) and *Les femmes savantes* (1672), the former displaying the absurd conceit of plebeians in seeking the culture, manners, and acquaintance of the nobility, the latter aimed against pretenders to taste and science. Molière's dramatic career terminated with the *Malade imaginaire*. He acted in its fourth representation, and returned to his chamber to die within an hour. A multitude of anecdotes indicate his nobility, truthfulness, unostentatious kindness, and generosity. As an actor he attained high success by his tact and finesse, by dint of study and effort, despite physical disadvantages. He excelled in the most difficult parts, in those of Arnolphe, Orgon, and Harpagon, and in the original and typical characters of Mascarille and Sganarelle. Though the most inventive of comic poets, few writers have borrowed so freely from others. His imitations of Italian, Spanish, and Latin comedies are constant and undisguised, and are to be attributed to the occasional character of many of his pieces, written in the exigency of the moment at the command and for the entertainment of the court. More than a century after his death, the French academy, which would have received him if he had consented to abandon his profession as a comedian, decided to admit his bust into its chamber with the inscription proposed by Saurin: *Rien ne manque à sa gloire; il manquait à la nôtre*.—Among the best editions of Molière are those of Anger (9 vols., 1819-'25), Aimé-Martin (8 vols., 1833-'6), Moland (Paris, 1871), and Despois (Paris, 1874 et seq.). The best biographies are by Taschereau (Paris, 1825; with supplement, 1827) and Bazin (1851). See also Moland, *Molière et la comédie italienne* (1867), and Lindau, *Molière* (Leipzig, 1872).

MOLINA, Luis, a Spanish theologian, born in Cuenca in 1535, died in Madrid, Oct. 12, 1600. He entered the society of Jesus in early life, completed his philosophical and theological studies at Coimbra, and was professor of theology at Evora in Portugal for 20 years. Among his works are *De Justitia et Jure* (6 vols., Cuenca, 1592, and Mentz, 1659), and *Commentarii in Primam Partem D. Thomæ* (2 vols., Cuenca, 1593). His fame rests chiefly on his *Concordia*, in which he undertook to reconcile the freedom of the human will with God's foreknowledge and foreordination. The peculiar system set forth in this work, called *scientia media*, Molina derived from his Jesuit master Fonseca, who avowed his responsibility for it when it was afterward most bitterly denounced. The doctrine of Molina was soon violently assailed by the Dominicans, and it was even denounced to the inquisition at Valladolid. The controversy became a quarrel between two great religious orders, the partisans of Molina being called Molinists and their antagonists Thomists, from St. Thomas Aquinas. The dispute was at length brought before

Pope Clement VIII., and a special committee of cardinals was appointed by him in 1597 to examine into the matter. After years of discussion they reported, and in 1609 Paul V. decided that both the Thomist and the Molinist system could be safely taught. The Jesuit Suarez modified Molina's system in a sense opposed to free will, and inconsistent with the latter's doctrine. In our own times Molina's doctrine has been openly taught in Rome, and is in favor with many Dominicans. His famous book was first published with the title *Liberi Arbitrii cum Gratia Donis, Divina Præscientia, Providentia, Prædestinatione et Reprobatione Concordia* (4to, Lisbon, 1588). An appendix containing a defence of his system appeared in 1589; and editions of the entire work were printed at Lyons in 1593, at Venice in 1594, and at Antwerp in 1595.

MOLINE, a city of Rock Island co., Illinois, on the E. bank of the Mississippi river, 3 m. above Rock Island, and at the intersection of the Chicago, Rock Island, and Pacific, the Rockford, Rock Island, and St. Louis, and the Western Union railroads, 179 m. W. by S. of Chicago; pop. in 1870, 4,166. The river is here divided by an island 3 m. long, and from 16 m. above to 3 m. below the city are the Upper Rapids. By means of a dam immense water power is obtained, and employed by various manufactories, constantly increasing in number and importance. The principal establishments are two extensive plough factories, a paper mill, a woollen factory, tub and bucket factory, wagon factories, founderies, machine shops, flouring mills, &c. The surrounding country contains extensive coal fields. The city has graded schools, including a high school, a free public library, two national banks, a savings bank, a weekly newspaper, and eight churches. It was first settled in 1832.

MOLINISTS. See MOLINA.

MOLINOS, Miguel de, a Spanish mystic, born in the diocese of Saragossa in 1627, died in Rome, Dec. 29, 1696. He studied at Pamplona and Coimbra, was ordained priest, and in 1669 settled at Rome. In 1675 he published in Spanish a work entitled "The Spiritual Guide," which passed in a few years through 20 editions. Its theories of a religious life, which obtained the name of "quietism," taught that spiritual perfection consisted in the perfect repose of all the faculties of the soul in God, and indifference to all the actions of the body. For those who attained this "fixed" or "continuous" state, there was no sin, and no occasion for anxiety. The "Spiritual Guide" was condemned by Pope Innocent XI. in 1687, and the author, after making a public recantation, was committed to prison, where he passed the rest of his life. When his papers were seized, 20,000 letters were found from persons desiring his counsel in spiritual matters. His doctrines were taught, in a form very much modified, by Mme. Guyon, and were echoed faintly in Fénelon's "Maxims of the Saints."

MOLIQUE, Wilhelm Bernhard, a German violinist and composer, born in Nuremberg, Oct. 7, 1802, died in Cannstadt, May 10, 1869. His father, who was chapelmaster, gave him his first lessons and taught him the use of several instruments. He showed a strong preference for the violin, and at the age of 14 was sent to Munich and placed under the instruction of Rovelli, whom he succeeded in 1820 as first violinist of the court. In 1822 he made a concert tour through Germany, which did much to increase his reputation. He was concert director at Stuttgart from 1826 to 1849, when he went to London, and in 1861 was made professor of composition at the royal academy of music. His works are mostly for the violin, and are held in high esteem. He has also written a symphony, a mass for voices and orchestra, and "Abraham," an oratorio.

MOLISE. See CAMPOBASSO.

MOLLER, Georg, a German architect, born at Diepholz, Hanover, Jan. 21, 1784, died March 13, 1852. He studied in Carlsruhe and in Italy, and was architect of the grand ducal court at Darmstadt. He published in 1818 a facsimile of the original design of the cathedral of Cologne, which he had discovered in Darmstadt, and which, with an additional design found subsequently, is followed in the completion of the two towers of that edifice. His works include many public and private buildings in Darmstadt and other places, and the ducal palace in Wiesbaden. His principal publications are: *Denkmäler deutscher Kunst* (3 vols., Darmstadt, 1815-'45); *Denkmäler deutscher Baukunst* (1821); and *Beiträge zur Constructionslehre* (6 numbers, 1835-'42).

MÖLLHAUSEN, Balduin, a German traveller, born in Bonn, Jan. 27, 1825. He came to the United States, in 1851 visited the Rocky mountains with Duke Paul of Württemberg, returned to Europe in 1852, and in 1853 was photographer and draughtsman to Lieut. Whipple's expedition to the Pacific. In 1857-'8 he was engaged in Colorado, with Lieut. Ives. Besides several novels, he has published *Tagebuch einer Reise vom Mississippi nach der Südsee* (Leipsic, 1858; English translation by Mrs. Sinnett, 2 vols., London, 1858; 2d ed., entitled *Wanderungen durch die Prairien und Wästen des westlichen Nordamerika*, 1860); *Reisen in die Felsengebirge Nordamerikas bis zum Hochplateau von Neu Mexiko* (2 vols., 1861); *Nord und Süd, Erzählungen und Schilderungen aus dem westlichen Nordamerika* (2 vols., Jena, 1867).

MOLLUSCA, a branch of the invertebrate animal kingdom, so named from the general softness of the body; some of its members were first defined by Aristotle under the name of *malaikia* (soft animals), of which the Latin *mollusca* and English mollusk are rude equivalents. Cuvier, between 1792 and 1817, determined the characters and boundaries of this branch by investigating its anatomical structure; before his time the study of the shells with which

most mollusks are provided, or conchology, had occupied almost the exclusive attention of classifiers. (See CONCHOLOGY, and MALACOLOGY.) The microscopic anatomy and embryology of mollusks led to the separation of cirripeds, and to their being placed among articulates in the class of crustaceans; for the same reason the *bryozoa* were taken from polyps and placed among acephalous mollusks, and since, with the brachiopods and ascidians, among articulates. The mollusca (*heterogangliata* of Owen) include such animals as have one or more nervous ganglia below the entrance to the alimentary canal, from which radiate cords which form a collar round the œsophagus and supply the other organs of the body; in the higher forms other ganglia are added above the œsophagus and unsymmetrically in different parts of the body. From the sac which invests the body they have been called *saccata* by Prof. Hyatt. In addition to the writers alluded to under MALACOTOLOGY, may be mentioned Poli, Rathke, Savigny, Chamisso, Pfeiffer, Deshayes, Forbes and Hanley, Loven, Quatrefages, Kiener, Chenu, Chemnitz, Rang, Alder and Hancock, Férussac, D'Orbigny, Philippi, Sowerby, Johnston, Martini, Huxley, Eschricht, and Delle Chiaie; and in the United States, Say, Conrad, Lea, Couthouy, Binney, Adams, Jay, Haldeman, Gould, Morse, and Hyatt.—In mollusca the body is covered by a soft moist skin, in or on which a shell is usually secreted; many have no head distinct from the rest of the body; the organs of sense are comparatively slightly developed, and the movements slow. Respiration is effected usually by gills; a heart is generally present, receiving the blood from the gills, and distributing it by arterial tubes; the capillaries are wanting, and the veins are replaced by sinuses; the blood is commonly whitish or whitish blue. The developmental energies seem to have been expended chiefly in the perfection of those organs concerned in the preservation of the individual and the species; some mollusks are hermaphrodite and require mutual impregnation, and in others the sexes are distinct; most are oviparous; the eggs, often connected in bunches or adhering to each other by a gelatinous substance, have a thin outer shell or chorion, sometimes of a horny consistence. The terrestrial species are few compared with those of fresh, and especially of salt water.—In the lowest class of *acephala* or headless mollusks, in the old classifications, we had the orders of *bryozoa*, *tunicata*, *brachiopoda*, and *lamelli-branchiata*. As stated under BRACHIOPODA and BRYOZOA, Prof. E. S. Morse regards the first of these orders as articulates, coming near the tubicolous worms; and there are good reasons, as there stated, for including also the *bryozoa* or *polyzoa* and the ascidians or tunicates among the articulates with molluscan affinities, which have been separated by recent authors under the division molluscoids. (See MOLLUSCOIDS.) The acephalous mollusks,

the lowest of the branch, the *lamelli-branchiata*, are characterized by a right and left shell, enclosing a depressed body, covered on both sides by a layer of the mantle; the branchiæ are at the sides of the body, mostly lamellar (whence their name) and placed under each lobe of the mantle, but sometimes pectinated; they are generally two on each side, and sometimes the triangular interval between them on the dorsal surface is used as a temporary deposit for the eggs. Most have four lamelliform tentacles, in pairs on the sides of the mouth; the shells are opened by an elastic ligament at the back, and are closed by one or two internal muscles, in the former case being called *monomyaria*, and in the second *dimyaria*. The heart is arterial, consisting of a ventricle and usually of two auricles, the former, being generally traversed by the end of the intestine. They inhabit both salt and fresh water, and usually live with the back uppermost, resting on the ventral edge of the shell; the sexes are in most cases distinct, and may often be recognized by the shape of the shell; some are hermaphrodite, and the young are sometimes considerably different from the adults; they are ovoviviparous. As a rule there are three central nerve masses, each consisting of two lateral ganglia, of which the first two are always distinct from each other. The valves of the shell are in most of the same shape and size, but in some of the fixed species the lower is the deeper; in the oyster, the lower and larger is the left valve; in some the valves close tightly, in others they are open at one or both ends for the passage of the foot and other organs. Along a part or the whole of the margin of the mantle are conical cirri or organs of touch, and also tactile gill-like laminae around the mouth; and this class is frequently sensible of light. Some have a firm and muscular prolongation from the abdomen called the "foot," possessing great contractility, by means of which they move about at the bottom of the water; at the base of the foot in others is a bundle of filaments, called the *byssus*, secreted by a glandular tissue, and occasionally united into a common mass; a familiar example of this is seen in the common mussel (*mytilus borealis*, Lamarck), which attaches itself by its silken threads very firmly to rocks, shells, and seaweeds; a few, unprovided with a byssus, grow fast by one of the shells to submarine objects. Many of this class are entirely fossil, and of some genera the extinct species are more numerous than those now living, the latter being in this case usually found in the Indian and South Pacific oceans. Among the monomyarians may be mentioned the common oyster and the comb or scallop shell (*pecten*); among the dimyrians, the pearl oyster (*meleagrina*), hammer shell (*malleus*), wing shell (*pinnna*), mussel (*mytilus*), ark shell (*arca*), freshwater clam and mussel (*unio* and *anodonta*), cockle (*cardium*), the great clam or *bénitier* (used in Roman Catholic churches to contain

holy water, sometimes 2 ft. wide, genus *tridacna*, the largest of the class), the horse-foot clam (*hippopus*), the edible quahaug (*venus mercenaria*, the shell from which the wampum of the American Indians was made), the small fresh-water *cyclus*, the common clam (*mya arenaria*), the razor shell (*solen*), the *pholas* (piddock or stone-borer), the ship worm (*teredo*), so destructive to timber in vessels and dock-yards, the waterpot shells (*aspergillum*), and the club shells (*clavagella*). All bivalves are very prolific; in those which, like the oyster, are fixed, the sperm cells of the male are carried by the currents of the water to the cavity of the mantle of the female.—The remaining three fourths of mollusks are called *encephala*, from having a distinct head, commonly with eyes and tentacles, and a mouth with a complex masticatory apparatus; they have been divided into the classes of *cephalophora* (head bearers) and *cephalopoda* (with the head surrounded by the feet). The *cephalophora* have been subdivided, according to the modifications of the locomotive organs, into the orders of *pteropoda*, *heteropoda*, and *gasteropoda*. The *pteropoda* are so called from two wing-like muscular expansions from the sides of the anterior part of the body, used as swimming organs, and not, according to Owen, homologous with the foot of gasteropods; they are small, marine, floating, hermaphrodite, and oviparous; the form is very variable, some being globular, others long and slender; the heart, as in the whole class, is arterial; the urinary sac, within the mantle and near the heart, communicates with the respiratory cavity and with the pericardial sinus, introducing water into the blood; some are naked, others are provided with very delicate shells of various forms; the eyes are not well developed, but the acoustic sac exists in all; the naked species have four tentacles, the testaceous ones two. In the family *thecosomata*, the head is indistinct, and the shell fragile; the best known genera of this family are *hyalea* and *cleodora*, found in the warmer temperate and tropical seas; some of them are beautiful objects, as they swim through the water like butterflies in the air; one of the largest and finest is the *H. tridentata*, three fourths of an inch long, commonly known as the "chariot of Venus." In the family *gymnosomata*, or naked pteropods, the head is distinct, and the fins are attached to the sides of the neck; it includes the genera *clio* and *pneumodermon*; of the former, the *C. borealis* exists in such immense numbers in high northern latitudes, that it forms a chief portion of the food of the Greenland whale, and is hence called "whale bait" by the fishermen; it is hardly an inch long.—The order *heteropoda* is characterized by a compressed fin-like foot having a suction disk; the branchiæ are fringed or pinnate; the sexes are distinct. All are marine, and usually are rapid swimmers with the back downward and the foot upward; the foot corresponds to the anterior portion of

this organ in gasteropods. They are sometimes called nucleobranchiata, and may be divided into the families *atlantida* and *jirolida*. In the first family belongs the *atlanta*, with a delicate shell large enough to protect the body, found in great numbers in the midst of the tropical and temperate oceans; in these the foot supports the operculum. In the second family is placed *carinaria*, sometimes called the "glassy sailor," which has an elongated body, with a very small keeled shell at the posterior part, the apex turned backward; on the head are two long tentacles, and two sessile eyes behind their base; the middle part of the foot is reduced to a compressed fin-shaped lobe, with a small suction disk, by which they adhere to seaweeds, &c.; their motions are rapid and graceful, and they inhabit the temperate and tropical waters; a small species is found in the Mediterranean; the shell of the *C. vitrea*, from the Indian ocean, is highly prized. In the genus *jirola* or *ptero-trachea* there is no shell, and the animal is almost transparent; there are two eyes, and generally no tentacles, but a slight fleshy proboscis; they swim or float free in mid ocean in great numbers, and also in the Mediterranean.—In the order *gasteropoda* there is a large muscular disk for creeping developed from the ventral surface of the body (hence the name), as in the common slugs and snails. They are usually unsymmetrical, the visceral portion of the body coiled spirally and protected by a univalve shell, the organs of respiration being generally atrophied; the shell is almost always closed by a calcareous, horny, or albuminous operculum. Most of them are marine, some inhabit fresh water, and a few are terrestrial; they have been divided according to the characters of the breathing apparatus. In some (*monœcia*) the male and female organs are in the same individual, in others (*diœcia*) the sexes are distinct; most are oviparous, but a few (certain snails) are ovoviviparous. In the water breathers the young are excluded with an operculated shell, which in the naked species is either shed or concealed by the mantle, and by means of ciliated fins on the sides of the head they move far away from their inactive parents, undergoing several metamorphoses in the process of growth; the air breathers pass through no such changes. They have the power of repairing injuries and of reproducing lost parts to a considerable degree. Among the monœcious gasteropods are the following five divisions: I. *Apneusta*, having no distinct respiratory organs, but in their place an extensive aquiferous system, and no shell in the adult; the body is soft and elongated, the integument ciliated; they are marine; *caliopa* and *actæon* are well known genera. II. *Nudibranchiata*, with the branchiæ extending freely from various parts of the body, as in *glaucus*, *doris* (sea lemons), in which the branchiæ form a plume-like circle in the middle of the back, and *elvis* (sea slugs), in which

they are papillose and arranged along the sides of the back. III. *Inferobranchiata*, like *phylidia*, in which the branchiæ are at the lower part of the sides of the body. IV. *Tectibranchiata*, in which the leaf-like branchiæ are covered by the mantle and a small shell; as in *aplysia* (sea hares), formerly dreaded on account of their strange form, and the violet fluid they eject when molested, in *umbrella*, and in *bulla* (bubble shell). V. *Pulmonata*, in which a part of the mantle cavity forms a vascular air sac or lung; most are terrestrial, and such as live in the water rise to the surface to breathe; a few are naked, but most are shell-bearing, without or with an operculum; in the inoperculated, with a well developed shell, are *helix* (snails), *succinea* (amber snail), *vitrina*, *bulimus*, *pupa*, *achatina*, and other land snails, the slugs (*limax*), land soles (*arion*), pond snails (*limnea*), &c.; in the operculated are *cyclostoma*, *helicina*, *acicula*, &c. In the dicioous gastropods belong the following four divisions: I. *Tubulibranchiata*, in which the branchiæ are two, symmetrical, behind the heart, and enclosed with the other soft parts in a long shelly tube; as in *dentalium* (tooth shells). II. *Cyclobranchiata*, in which the branchiæ are a series of lamellæ, surrounding the body between the foot and mantle; as the limpets (*patella*) used as food and for bait, and the sea wood-lice (*chiton*), with multivalve shell pieces like the carapace of articulates. III. *Dentibranchiata*, in which the branchiæ are plumose or pectinate, and with the body protected by a widely opened inoperculate shell; as in the ear shells (*halotis*); the delicate violet shells (*janthina*), found abundantly in mid ocean, feeding upon the scalephar *velella*, and suspended by a raft of air vesicles, to the under surface of which the egg capsules are attached; and the *fissurella*, or key-hole limpets. IV. *Pectinibranchiata*, in which the two comb-like branchiæ are contained in a dorsal cavity of the mantle opening widely above the head; they have two feelers and two eyes, and a proboscis capable of elongation in a tube form; the females secrete an albuminous matter in which the eggs are enveloped, a familiar example being the yellow grape-like bunches of the whelk (*buccinum*). Here belong the bonnet limpet (*calyptraea*) and the slipper shell (*crepidula*); the top shells (*turbo*), and the pheasant shells (*phasianella*); the river snails (*paludina*), the periwinkles (*littorina*), the turret shells (*turritella*), the wentletraps (*scalaria*), the *cerithium*, and *natica*; cowries (*cypræa*), very handsome shells, and one species, *C. moneta*, used as money on the W. coast of Africa; *marginella*, *coluta*, *mitra* (mitre shells); the tuns (*dolium*), harps (*harpa*), whelks (*buccinum*); rock shells (*muræx*), fig shells (*pyrula*), wing shells (*strombus*), the seraphs (*terebellum*), and numerous others. —The class of *cephalopoda*, the highest type of mollusks, is characterized by the locomotive and prehensile organs being attached to the head, whence they radiate in the form of mus-

cular arms and tentacles, and by an internal skeleton combined in some with an external shell, though the integument in most is uncalcified and flexible; the head is free and the body is covered by a muscular sac or mantle, with a transverse anterior aperture, from which projects the expiratory siphon or tube; the branchiæ are concealed, the sexes distinct, and the animals oviparous, aquatic, marine, predatory and carnivorous, nocturnal, and social; the colors are changeable and brilliant; they emit an inky secretion when disturbed, which permits them to escape by the discoloration of the water; this is what the true India ink is made from. This class have a rudimentary internal skeleton; in the head of most is a cartilaginous ring around the œsophagus, the upper part covering the cerebral ganglion, and containing the organs of vision and hearing; there is often an additional cartilage to which the muscles of the arms are attached, and others on the back and sides. The mouth is in the middle between the arms, and has two jaws like the bill of a parrot, the lower the larger; the head is separated from the body by a constriction like a neck; there is a well marked tongue. The sexual organs are at the base of the visceral sac, and the spermatophores are very active; in some of the octopods, one of the arms is deciduous, and becomes a male organ, described by Cuvier as *hectocotylus* and a parasite; the eggs are laid in heaps or bunches, attached to each other and to foreign bodies. The nervous system is largely developed. For respiration water is drawn in and expelled by the muscular action of the mantle and funnel, as the gills have no vibratile cilia; the water enters the branchial cavity at the anterior opening of the mantle, and is forced out through the funnel, propelling the animal backward. In the first order, the *tetrabranchiata*, the branchiæ are in two pairs, without branchial hearts, and the mantle is thin and not very muscular; the ink bag is absent; the arms are very numerous, hollow, and with retractile tentacles; eyes pedunculate; the head retractile within a many-chambered siphunculated cell. Among existing mollusks this order contains only the genus *nautilus* (see NAUTILUS); in past ages lived the ammonites, baculites, hamites, orthoceratites, turritiles, &c. In the second order, the *dibranchiata*, the branchiæ are two, each with a branchial heart; the funnel is an entire tube, and the mantle is muscular; an ink bag is present; there are eight non-retractile arms, large and complicated, bearing sucking disks or *acetabula*, with usually two additional long arms; the eyes are sessile and in orbits; the shell is internal, except in the female argonauts. In the decapod tribe, with eight arms and two tentacles, belong the genus *spirula*, the extinct belemnites, the cuttle fishes (*sepia*), and the squids. (See SQUID.) In the octopod or eight-armed tribe there are no tentacles, the arms have sessile suckers, and the branchial chamber is divided by a longitu-

dinal partition; the arms are more robust, and are often united by a web at the base, constituting a powerful swimming organ. Among the naked octopods belong the so-called sea spiders. (See OCTOPOUS.) *Eledone* and *tremoctopus* are allied genera. The genus *argonauta* or paper nautilus is well known for the delicate and beautiful shell of the female. (See NAUTILUS.) The shell is used only for protecting and hatching the eggs; the male has no shell, and impregnation is effected by a deciduous *hectocotylus*.—The local distribution of faunæ and the distinctness of zoological regions are well illustrated by mollusks; while some are very limited in their range, others, like the *cyprææ*, are extensively spread even across ocean barriers; some are cosmopolite, wandering wherever their food is found; *helix cellaria*, attaching itself to water casks, occurs in most seaports of the world, *H. similis* wherever the coffee plant grows, and *H. vitrinoides* follows the taro or *arum esculentum*. As a general rule, according to Mr. Jeffreys, specimens are larger toward the north than toward the south; colors are usually the brightest in the tropical seas, except in specimens from great depths. (For details on distribution, see "Mollusca and Shells of the United States Exploring Expedition," 1838-'42, by A. A. Gould, M. D., Boston, 1852.) The distribution of mollusks in time extends from the lower Silurian to the present epoch; all the classes are represented in the earliest fossiliferous strata; some families, like the ammonites and belemnites, have passed away; others, like the nautilus, are verging toward extinction; some have continued with slight specific modifications from the Silurian to the present day. Lamelibranchiate have succeeded palliobranchiate bivalves; siphonate have succeeded asiphonate univalves; and the dibranchiate now vastly outnumber the tetrabranchiate cephalopods. Whole strata of the earth's crust are made up principally of the shells of mollusks.—Mollusks supply an abundant, wholesome, and usually easily digestible article of food to nations civilized and savage, as well as to other animals; bivalves are considered the best, as having the least muscular fibre. The ornamental purposes to which the pearl and cameo shells are put are well known; from the cuttle fish is obtained sepia and India ink; from the *purpura* and *buccinum* of the Mediterranean came the famous Tyrian dye of antiquity; from the filaments of the byssus of *pinna* are made tissues much esteemed on the shores of the Mediterranean. On the other hand, mollusks are sometimes injurious to man; slugs and snails do mischief in gardens; the *teredo* pierces ship timber, and the *pholas* bores into and weakens stone dikes. The number of species of mollusks probably exceeds 25,000, surpassed only by the number of articulate.

MOLLUSCOIDS, a division of the old branch of *mollusca*, first made by Milne-Edwards to include the *bryozoa* and ascidians or tunicates,

to which have since been added the brachiopods; all of which are now regarded by Prof. E. S. Morse and others as articulate, having certain molluscan affinities, but coming nearest to the tubicolous worms. (See BRACHIOPODA, and BRYOZOA.) In the lowest of these, the *bryozoa*, are comprised small pedunculated animals, the margin of whose body is provided with vibratile cilia, for producing the water currents necessary to respiration and to the obtaining of food; these cilia are sometimes supported on long tentacular prolongations; the digestive cavity is distinct from the walls of the body, and can be traced as a canal from mouth to vent, both opening within the ciliated circle, being reflected upward; they propagate by buds and by free swimming ciliated gemmules. They seem to have both males and females on the same stem, the cells containing animals with eggs being apparently more numerous than those with spermatozoa; the muscular system is largely developed, and serves principally to retract the animal within its cell. They have been divided by Van der Hoeven into the families: 1, *stelmatopoda*, in which the tentacles are disposed in a zone around the mouth, as in the genera *eschara*, *flustra*, and *cellularia*; and 2, *lophopoda*, with tentacles set pectinately on two arms, and numerous, such as *cristatella*, *plumatella*, and *alcyonella*. The *tunicata*, including the ascidians and *salpæ*, have no shells, but are enclosed by an elastic, cellulose, uncalcified integument, having two apertures; the circulation is peculiar in the phenomenon of venous blood at one time proceeding from the heart to the gills, and at another arterial blood from the gills to the heart, in the same vessels; respiration is effected either by a vascular ciliated pharyngeal sac, or by a ribbon-shaped gill stretched across the common visceral cavity; the nervous system presents a single ganglion, from which the nerves radiate; organs of feeling, sight, and even hearing, have been described in these animals; muscular fibres, both longitudinal and transverse, are well developed. In *salpæ* we have free swimming animals, drawing in water by one aperture and expelling it by another one opposite; they are numerous in the Mediterranean and in the temperate parts of the ocean far from the shores, and are said to be phosphorescent at night; they sometimes occur singly, and sometimes in long chains or in rings; Chamisso concluded, from observing the living animals, that a generation of distinct *salpæ* alternates with one of those in a chain; within the single individuals connected embryos were found, which, with other similar phenomena, led to the interesting work of Steenstrup on the "Alternations of Generation;" the solitary *salpæ* are sexless, and are propagated by internal germs or buds, and are inferior to the associated forms, which have reproductive organs; the latter produce each a single young one. The ascidians have a sac-like body, with two apertures generally near together;

the branchial sac is large, the opening of the œsophagus situated at the bottom; they are mostly attached, and propagate both by eggs and buds, the male and female organs being on the same individual. They are both simple and compound. Those young which originate from eggs move free in the early stage, and have a long tail which is lost when they fix themselves by the opposite extremity; in the compound forms, larvæ of this description may enclose a group of eight united ascidians, by their division laying the foundation for a colony while yet free, capable of greater multiplication by further gemmation. Ascidians are found from the tropics even into the arctic regions, and some of the compound forms are brilliantly phosphorescent. The non-pedunculated single ascidians were known to Aristotle, and were called by him *tethuon*; sometimes called bagpipes, these animals are often seen attached to rocks, shells, crabs, and other bodies; though several may be found in a group, they do not form a compound body with a common external covering; they are occasionally found attached to a shapeless mass formed by the bodies of other ascidians. The food consists of small organic particles, which are brought with the water into the branchial sac and to the œsophageal opening at the bottom.—The brachiopods, or *palliobranchiata*, have the body depressed, covered with a mantle, bilobed and open; the branchiæ are not separated from the mantle; the heart is double and arterial; near the mouth are two long spirally convoluted arms (whence the name of the order) provided with cirri or cilia; the mouth is simple, at the base of the arms; the shell is bivalve, always attached either by a peduncle or by the shell, and adheres to the mantle by several oblique muscles; there is no elastic ligament at the hinge, which is opened by the arms and by internal muscles; all are aquatic and marine. They include the *terebratulæ*; the extinct spirifers, *orthis* and *productus*, with articulated calcareous shells; and the *crania* and *lingula*, the last interesting as occurring with slightly modified species and with few interruptions from the Silurian to the present epoch.

MOLOCH, or **Molech**, the national god of the Ammonites, who was worshipped by human sacrifices. The Hebrews were repeatedly addicted to his worship. Solomon, induced by his foreign wives, built a high-place to him; Manasseh imitated his impiety; and the idolatry continued from that time chiefly in the valley of Tophet and Hinnom, till the place was defiled by Josiah. Some explain the terms which are generally thought to refer to the burning of children as sacrifices to Moloch, to mean only the passage between two burning pyres, or the act of leaping over a fire, as a symbol of purification, practised by many ancient nations. Milcom (1 Kings xi.; 2 Kings xxiii.) and Malcham (Jer. xlix.) are considered dialectic variations of the name Moloch, which probably signified king (Heb. *melek*h).

MOLOCH, an Australian iguanian reptile, of the family *agamidæ*. The *M. horridus* (Gray) is the most ferocious-looking of the lizard tribe, and, though harmless, is as ugly as any of the representations of fabled basilisks and dragons. The whole body is covered with irregular plates and strong sharp spines, and the head is crowned with two very large spines; on the back of the neck are large rounded protuberances, similarly armed with granular scales and spines.

MOLOSSIA, or **Molossis**, in ancient geography, a division of Epirus in northern Greece, extending across the province from N. to S., partly between Athamania on the east and Thesprotia on the west. In early times it was peopled by various tribes of unknown race, with whom the Molossi, a Grecian people who claimed descent from Pyrrhus (Neoptolemus), the son of Achilles, mingled at a later period. Though regarded as semi-barbarians, the Molossians became predominant in Epirus, and established a royal dynasty over the whole country in the last quarter of the 4th century B. C., the capital being Ambracia (now Arta), near the gulf called after it.

MOLTKE, Helmuth Karl Bernhard von, count, a German general, born at Parchim, Mecklenburg, Oct. 26, 1800. His father was a Danish general, and he was educated in the cadets' academy at Copenhagen, and at 18 became an officer. He entered the Prussian service in 1822, and after ten years of arduous studies and labors was admitted to the general staff. In 1835 he went to Constantinople, and Mahmoud II. conceiving a high regard for his genius, the Prussian authorities permitted him to serve him in improving the fortifications of Turkish cities and in the warfare against the Kurds and against Egypt. He returned to Berlin after the sultan's death in 1839, was employed for many years in staff service, and in 1856 became adjutant of Prince Frederick William, and in 1858 chief of the general staff of the army, which post he still holds. The rank of lieutenant general was conferred upon him in 1859. He planned the operations in the wars with Denmark (1864) and Austria (1866), accompanying on the former occasion Prince Frederick Charles, and on the latter King William. After the battle of Sadowa Moltke made every preparation for marching upon Olmütz and Vienna, but negotiated a five days' truce, which became the prelude to peace. He was rewarded with the order of the black eagle and the command of the Kolberg or second Pomeranian grenadier regiment. Having long foreseen the contingency of a war with France, he was ready with his plans when it suddenly broke out in 1870, and their execution resulted in the most astonishing and uninterrupted series of victories ever achieved by one great military nation over another. His system consists mainly in making the different army corps advance separately and operate simultaneously in grappling with the enemy, and he brings to

bear upon its elaboration a mind of singular clearness, a wonderful logical power, and a capacity of patient research of the highest order. Besides conferring on him the title of count and making him large donations, the emperor of Germany appointed him in 1871 general field marshal, and in 1872 life member of the upper house. In January, 1874, he was returned to the Reichstag, and in the following month delivered a speech showing the necessity of being prepared for retaliation on the part of France, which produced a strong impression. His most important work is *Der deutsch-französische Krieg* (Berlin, 1873 et seq.).

MOLUCCAS, or Spice Islands, a group of the Indian or Malay archipelago, between lat. 3° N. and 9° S., and lon. 122° and 133° E., scattered over the sea which extends from the E. coast of Celebes to the W. coast of Papua, and from the Philippine islands on the north to Timor on the south; area, 42,946 sq. m.; pop. in 1871, 331,879 natives and 1,803 Europeans. The number of the islands is estimated at several hundreds; many of them are small and uninhabited. The large islands are Ceram, Gilolo, and Booro. This part of the archipelago is naturally divided into three clusters, viz., the Moluccas proper or Gilolo group, the Ceram group, and the Timor Laut group. The first comprehends Gilolo, Morty, Mandioly, Batchian, Oby, Motir, Makian, Ternate, Tidore, and many other islands. The Ceram cluster, which lies in the centre of the group, contains, among others, the islands of Ceram, Booro, Amboyna, and Banda. The third cluster lies further S. between Australia and the west of Papua, Timor Laut being the principal island. Originally, and in a more circumscribed sense, the Moluccas comprehended only the small islands off the W. coast of Gilolo, including Batchian, Motir, Ternate, and Tidore; under the early Dutch dominion the appellation was extended to Amboyna and Booro, but was still restricted to the smaller isles. The outline of the coast of the Molucca islands is very irregular; in many places they rise abruptly from the water to a considerable elevation. There are many excellent harbors, but sand banks which render navigation intricate and dangerous are frequently formed by earthquakes. Nearly all the islands are mountainous, and some of them contain peaks 7,000 or 8,000 ft. high. The formation of the group is volcanic; the surface is singularly broken and indented with lofty peaks and rocks piled up to great elevations; there are several active craters and hot springs, and violent earthquakes are frequent. On account of the comparative smallness of the islands and the regular monsoons, the heat is never excessive. Cereals cannot be cultivated to any great extent, and the people subsist almost entirely upon the pith of the sago palm. The most common tropical fruits and vegetables thrive well, and sugar cane, coffee, pepper, cotton, and small quantities of indigo are grown; but

the Moluccas are especially remarkable for the production of cloves and nutmegs. The bread-fruit tree, the cacao, and many of the fruit trees of India are found. There are more than 400 different kinds of wood in the forests, including the *lingoa* (*pterocarpus draco*), which is admirably adapted to cabinet work. Gold is found in small quantities on Gilolo, but no other metals on any of the islands. The group has comparatively few indigenous mammals, but birds are very numerous, and the fauna presents close affinities to that of Papua. Of the mammalia there are 35 known species, including 25 bats, a baboon-monkey, a civet cat, several species of pigs, a deer, a shrew, and four marsupials, one of which is a flying opossum. Of birds there are 265 species known to inhabit the group. These comprise the cassowary, found in Ceram, the *megapodii* or mound makers, 22 species of parrots, and 27 species of pigeons. The surrounding seas are exceedingly prolific, and the cachalot, which yields the spermaceti of commerce, is met with; but the whale fishery, once of some importance in this region, is now quite insignificant. Pearls are frequently found on the coasts. Cloves and nutmegs are exported in large quantities; sandal wood and other valuable woods are obtained; edible birds' nests, sea slugs, and shark fins are sent to China. The imports are chiefly opium and Indian and European goods. The Dutch monopolies confined the commerce for many years within very narrow limits, but a more liberal policy is now pursued.—The Moluccas, like nearly all the islands which constitute the Indian archipelago, are chiefly inhabited by two races, the Malays and Papuans. The latter people, supposed to be of the same family as the aborigines of Australia and Papua, have been exterminated in many of the smaller islands by the Malays, and in the larger ones have only retained possession of the interior and more inaccessible parts. The Moluccan Malays, according to Wallace, form one of the five divisions of semi-civilized Malays found in the Indian archipelago. They are in possession of the lower lands and seacoasts, where they cultivate the soil or gain a subsistence by fishing. They are very expert in the construction and management of their vessels, and are greatly addicted to piracy. The Malay is the common language, and the Arabic character is employed in writing it. Mohammedanism is the prevailing religion; but some profess Christianity, and distinguish themselves by wearing black garments. The laws are chiefly founded upon the precepts of the Koran.—The Moluccas had been visited by the Arabs, and the Mohammedan religion spread among the people long before the arrival of the Portuguese in 1511. The Portuguese had only begun to form settlements when the Spanish vessels under Magalhaens arrived from the east, and a prolonged dispute arose between the two nations respecting the possession of the islands, which

terminated in favor of the Portuguese. A system of violence and oppression was maintained for 60 years, when the Dutch with the assistance of the natives expelled the Portuguese. The Dutch East India company early in the 17th century obtained supremacy over many of the native princes, and allowed them to retain their authority by tribute to the company. To secure the exclusive trade in nutmegs and cloves, the Dutch nearly extirpated the spice trees on all the islands except Amboyna and Banda, which two they reduced entirely under their authority. To keep up prices in foreign markets, they frequently burned whole cargoes of spices. The English were allowed at one time to have a mercantile establishment at Amboyna, when held by the Dutch; but the latter in 1622, after forcing some Chinese and Javanese soldiers by torture to make confession of a plot on the part of the English, seized on the leaders and put them to death with horrible cruelty. In common with the other Dutch East Indian possessions, the Moluccas were held by the British from 1796 to 1802, and from 1810 to 1814. In 1824 some of the more oppressive laws were repealed, and the free cultivation of the islands was allowed. The Dutch possessions are divided, in point of administration, into the three residencies of Amboyna, Ternate, and Banda. The seat of the Dutch governor general is at Amboyna.

MOLYBDENUM, a metal usually obtained from the native bisulphide (molybdenite). It is also found as a molybdate of lead. Its symbol is Mo; atomic weight, 96; specific gravity, 8.6. The resemblance of the bisulphide ore to graphite gave the metal its name (Gr. *μολύβδανα*, a piece of lead). It was first distinguished from graphite by Scheele in 1778, but was first obtained in the metallic form by Hjelm in 1782. The most complete investigations of its properties and combinations were made by Berzelius. The metal may be obtained by roasting the native sulphide in a free current of air, by which impure molybdic acid is produced in the form of a gray powder. This is digested in ammonia, the solution filtered and evaporated to dryness, the residue dissolved in nitric acid and again evaporated to dryness, pure molybdic acid being left. This being made into a paste with oil and charcoal and heated to whiteness, the oxygen is abstracted and the metal remains. It may also be obtained by passing hydrogen over molybdic acid at a red heat in a porcelain tube. It is a white metal, brittle, and difficult to melt. When heated to whiteness in the air or in oxygen, it forms a crystalline sublimate of molybdic acid. It is easily oxidized by nitric acid, with evolution of nitrous acid fumes, and if ignited in a stream of aqueous vapor hydrogen is evolved. Molybdenum forms alloys with tin, lead, iron, copper, silver, gold, and platinum, rendering them less fusible, more brittle, and, except the silver, whiter. It forms three oxides: protoxide, MoO (or according to Rammelsberg, who

doubts the existence of MoO, sesquioxide, Mo₂O₃); the dioxide, MoO₂; and a third, molybdic anhydride, MoO₃. The first two possess basic characters, while the last is an active acid. The protoxide (or sesquioxide) is obtained by dissolving molybdic acid in hydrochloric acid, and placing in the solution zinc or one of the metals capable of decomposing water, and afterward treating with excess of ammonia. The dioxide is obtained by heating a mixture of sal ammoniac and molybdate of soda and digesting the residue in caustic potassa. Molybdenum forms with bromine dibromide, tribromide, and tetrabromide, and with chlorine and sulphur corresponding salts; and there may also be formed chloro-bromides. The iodine compounds are molybdous and molybdic iodides. Molybdic anhydride forms salts with various bases, called molybdates. The molybdate of ammonium is used as a delicate test for phosphoric acid. The solution suspected to contain the phosphate is acidulated with nitric acid, and the molybdate is added. If phosphoric acid is present, either free or uncombined, a yellow crystalline precipitate is formed, consisting of molybdic and phosphoric acids in combination with ammonia. Arsenic acid forms a similar compound with ammoniac molybdate when the solutions are boiled. A mixture of sulphuric and molybdic acids yields a beautiful purple with pure morphia or its salts. The oxygen salts of molybdenum are not well enough known or of enough importance to require notice here.

MOMBAS, Mombaz, or Mombasah, a town on a small island of the same name, in a bay on the coast of Zanzibar, in lat. 4° 6' S., lon. 39° 43' E.; pop. of the island, about 6,000. The island is about 3 m. long and 2 m. wide; the coasts consist of steep cliffs, and the town is defended by an old Portuguese fort. The town is in a ruinous condition, and is inhabited by Arabs and people of mixed race. The bay in which the island is situated is about 5 m. long and 3 m. broad, and forms an excellent harbor. There is very little trade, and the people are exceedingly poor. The Portuguese destroyed the native town in 1505, and again in 1529; from which time they held the place till they were driven out by the sultan of Muscat in 1720. In his turn he was expelled by the natives, and from 1824 to 1826 the town was under British protection; but they abandoning it, Mombas fell again under the power of Muscat.

MOMMSEN, Christian Matthias Theodor, a German historian, born at Garding, Schleswig, Nov. 30, 1817. He studied at Altona and Kiel, was aided by the Berlin academy in his archaeological explorations in France and Italy (1844-'7), and in 1848 was attached to the staff of the *Schleswig-Holstein'sche Zeitung*. For participation in the movements of 1848-'9 he was removed from the chair of jurisprudence at Leipsic, which he had filled for two years. From 1852 to 1854 he was professor at Zürich, from 1854 to 1858 at Breslau, and from that time till

February, 1874, professor of Roman archæology in the university of Berlin, when he was reappointed professor of jurisprudence at Leipsic, and made rector of the university. He has published *Oskische Studien* (Berlin, 1845; supplement, 1846); *Ueber das Römische Münzwesen* (1850); *Corpus Inscriptionum Neapolitanarum* (1851); *Die Stadtrechte der Lateinischen Gemeinden Salpensa und Malaga* (1855); and *Römisches Staatsrecht* (3 vols., Leipsic, 1871-'5 et seq.). Of his "History of Rome" (3 vols., Berlin, 1854-'6) five editions have appeared, the last in 1869. It has been translated into French (Paris, 1863-'72), and into English by W. P. Dickson (2 vols., London, 1862-'3; new ed., 4 vols., New York, 1871).

MOMOTOMBO, the loftiest volcano in the republic of Nicaragua, 7,200 ft. high, standing at the head of Lake Managua, 25 m. E. by N. of the city of Leon. It sends out constantly a light plume of smoke, and occasional showers of fine ashes. The upper 3,000 ft. of its elevation seems to be made up of ashes and scorïæ. A tradition that the early priests who undertook to plant the cross on its summit were never afterward heard of, is the subject of a poem in *La légende des siècles*, by Victor Hugo. There are hot springs at its base, and a number of orifices or vents (*infernillos*) on its flanks. It is a prominent landmark from the sea, and constitutes one extremity of the volcanic range of the Marrabios, which terminates in the high cone of El Viejo.

MOMPOS, or **Mompox**, an inland city of the United States of Colombia, in the state of Santa Marta, on the Magdalena, about 300 m. N. by W. of Bogotá; pop. about 11,000. The city is on a large island formed by the Magdalena, the Caño Lova, the Caño Sיעuco, and the Cauca. The streets are very long, wide, and well kept. Some of the houses have two stories, are tiled-roofed, and present an agreeable aspect. Besides the parish church, there are three other churches attached to convents, all well built. Several primary schools were opened in 1872 and 1873. The climate is hot, humid, and generally unhealthy; the thermometer ranges for most of the year from 85° to 100° F. Alligators and mosquitoes of enormous size are common. It is rare to see a native free from goitre. The soil is remarkably fertile. The port is defended by forts of comparatively modern construction, and there is an excellent mole which protects the city from damage during the periodical swelling of the river, which in December often rises 12 ft. above its usual level. Mompos was long the principal entrepot for the whole basin of the Magdalena; and an important trade is still carried on with Ocaña, Giron, Antioquia, and the upper Magdalena, in tobacco, sugar, flour, cacao, coarse cotton fabrics, and precious metals.—The city was founded in 1540. It has experienced several disastrous inundations, especially in 1762, when the inhabitants were saved by taking to canoes.

MOMUS, in Greek mythology, the god of mockery and censure, said to have been a son of Night. Having been chosen by Neptune, Minerva, and Vulcan to decide on the merits of their respective works, he censured them all, in consequence of which he was expelled from heaven. He is generally represented raising a mask from his face, and holding a small image in his hand.

MONACHISM (Gr. *μοναχός*, solitary), a term denoting solitary life or retirement from the ordinary concerns of the world, with a view to the occupation of the soul with religious objects. The first type of monachism may be found in the asceticism practised by the Jewish Essenes and Therapeutæ at the dawn of Christianity. Origen gives the name of *ascetes* to persons who fast rigorously. It was also applied to all who habitually devoted several hours of the day and night to prayer, or who bestowed their wealth and time in relieving the sick and poor. These ascetics generally dwelt in the cities, and wore distinctive garments of a dark color, together with the pallium or cloak of the ancient philosophers. During divine service the ascetics were assigned an intermediate place between the clergy and the laity. A severer form of asceticism was the life led by anchorites or hermits. Their numbers increased very much during the 3d century, filling the mountain wildernesses of Asia Minor, Syria, and Egypt. Communities of women were organized as early as the close of the 3d century. According to Döllinger, the term *μοναχισμὸς* was first applied to the common abode of the Egyptian therapeutæ. It is also in Egypt that the first known Christian monasteries or monachal communities of men were formed by Paul of Thebes and his disciple Pachomius. The germ of these establishments was planted by Paul in the island of Tabenna, a little north of the first cataract of the Nile, and was developed by Pachomius, who first drew up a rule for monks in 340. Several monasteries were united under his government. Each monastery was divided into several "families," and each family pursued a distinct mechanical occupation and was governed by a prior. The family counted 40 monks, who dwelt there by threes in separate cells. Some monasteries comprised 40 families. When Athanasius in 356 took refuge in the island of Tabenna, Pachomius met him at the head of an army of monks singing psalms. In imitation of Pachomius, Ammon founded a monastery on a hill above the valley of Nitria, on the confines of the Libyan desert, where 5,000 monks soon assembled under him; and Macarius next established numerous monasteries in the desert between the Nitrian mountains and the Nile. Near Arsinoë the abbot Serapion ruled 5,000 monks; and Rufinus says that in 356 the monasteries of Oxyrinchus contained 10,000 men and 15,000 women. The life of the inmates was divided between private prayer, public psalmody, the study of the Scriptures, the copying of manu-

scripts, agricultural and mechanical occupations, and the various offices of charity. These monasteries were great industrial schools, and those of the Thebaid served as hostleries for travellers over the desert; for each had its *xenodochium* in which gratuitous hospitality was exercised. Pachomius had made the study of the Bible a special duty; all his monks were obliged to know how to read and write; and in each monastery of Tabenna there was one family exclusively composed of learned men, skilled in Greek literature. These institutions were replenished constantly with the disciples of the Alexandrian schools, and reacted occasionally upon the intellectual life of the latter. —The monastic institutions of Egypt were imitated in Syria, Asia Minor, and the southern shores of the Black sea, eremitical life being in the 4th, 5th, and 6th centuries everywhere superseded by the cenobitical. St. Hilarion became in 328 the father of monastic life in Palestine; Eustathius, bishop of Sebaste, propagated it about the same epoch in Armenia; St. Basil about 360 spread it in the province of Pontus; and St. John Chrysostom, who found it flourishing around Antioch, extended its influence by word and example. —The practices of eremitical life were never regarded with much favor either by the great church fathers or by the councils. They rather aimed at forming, by the temporary exercise of the ascetic virtues, apostolic men fitted to spread the reign of gospel truth among the city populations. With still less favor did they regard the extraordinary performances of the Sarabaitæ, Stylites, Acemetæ, Agonistæ, and the like. From the desert, monastic institutions were transplanted to the towns, and ecclesiastical writers soon complained that many fled to the convent only for the purpose of finding there a life of ease; that the mask of piety served frequently for concealing laziness and wickedness; that excessive asceticism led many to licentiousness, insanity, despair, and suicide; that ignorance and fanaticism made the monks dangerous tools in the hands of ambitious men, and that their zeal could be turned to acts of violence against Chrysostom as well as to the destruction of pagan temples or the suppression of Arianism. The emperor Valens and several of his successors vainly sought to arrest the too rapid increase of monachism. The contemplative life led many into gross anthropomorphism, which caused their exclusion from the church. But though many censured the abuses of monachism, few were found, like Jovinian, to assail the principle. Under the growing influence of the Byzantine emperors, the eastern church, and with it eastern monachism, lost all vitality. No attempts were made to create new organizations. Traditionally all the eastern monks have followed up to the present day the so-called rule of St. Basil, and have called themselves after either St. Basil or St. Anthony. They are still numerous in all the eastern churches,

and some of their establishments, as the convents of Mount Athos, are still celebrated for their literary treasures or political influence; but they have ceased altogether to be powerful agencies of religious influence. —Monachism was destined to achieve its greatest successes in the West. About 340 Athanasius during his second exile went to Rome with some Egyptian monks. Later he met St. Martin of Tours, still a soldier, in the imperial city of Treves, and confirmed the latter in his resolution of embracing a monastic life. Martin founded, it is said, the first monasteries established west of the Alps, and may thus be called the father of monachism in Gaul. Cassian, his contemporary, planted another monastic colony at Marseilles, and wrote there his book "On Monastic Institutions." The disciples of St. Jerome were obliged to follow him to Bethlehem. Ambrose founded a monastic establishment at Milan, and there he converted Augustine, who in his turn became in north Africa the originator of a form of monastic life that was to live afterward in thousands of European institutions. Augustine before he became a priest lived near Carthage a semi-eremitical life with a few friends; and the rule which they then followed served as the basis of the rule adopted long afterward by the Augustinian order, or hermits of St. Augustine. After his ordination, and especially during his episcopal life, he lived in community with his brother priests; and their mode of life, together with the monastic regulations scattered through his writings served as an exemplar for the countless houses of canons regular throughout Christendom, for the orders of Fontevault and Prémontré, for the Gilbertine canons regular in England, the order of friars preachers, and innumerable orders of women. The Augustinian manner of living was brought over to England by Pelagius, and to Ireland by St. Patrick. Monastic establishments and schools in the time of St. Patrick sprang up around the great churches as well as institutions favorable to seclusion and study. St. Columba sent monastic colonies into Scotland, the Hebrides, and the Orkneys. The first Northmen who colonized Iceland found Irish monks there before them. St. Columbanus passed over into Gaul with 12 companions, who founded numerous similar institutions in that country, Switzerland, Germany, and northern Italy. England had flourishing cenobitic establishments in the same centuries. But in the monasteries founded in continental Europe by these Irish monks, the rule of St. Benedict of Nursia soon superseded that of Columbanus. Benedict in 529 built at Monte Casino two oratories in honor of St. John the Baptist and St. Martin of Tours, and his rule spread rapidly over all western Europe, uniting independent establishments in one great monastic hierarchy. The good effected by the monasteries of both sexes, not only in the work of conversion and education, but even in promoting agriculture and

the other useful arts, met such general approbation that attempts were made to subject all the secular clergy to living in common under a rule. This movement was commenced by Chrodegang of Metz, who established the canons regular, but, though often renewed, could never be fully carried out. But the esteem in which the monastic orders were held, and the generous benefactions of princes, prelates, and peoples, facilitated the growth of corruption.—For many centuries the history of monachism presents a continued struggle of reformers with the laxity or immorality in the convents of their times. The first of these reformers was Benedict of Aniane (died 821), whose commentary on the rule of Benedict of Nursia obtained later an equally authoritative character. Benno, who became in 910 abbot of Cluny, founded the congregation of Cluny, a main pillar of the reformatory party, which was exempted by the pope from episcopal jurisdiction, and received the right of choosing an abbot with quasi-episcopal rank. Romuald founded the congregation of Camaldoli in 1012, Gualbert that of Vallombrosa in 1036. The Cistercians owed to St. Bernard of Clairvaux so great a celebrity, that they were soon introduced into nearly all the European countries. The order of Grammont sought to excel in ascetic rigor, and that of the Carthusians adhered more faithfully than any other order to its original spirit. The order of St. Anthony (1095) and the Hospitallers (1078) devoted themselves to the nursing of the sick, the order of Fontévrault (1094) to the correction of lewd women, and the Trinitarians (1198) to the redeeming of Christian prisoners. Even the warlike tendencies of those times sought a union with the monastic spirit by the establishment of several orders of knights. The large increase of the number of orders called forth much opposition, and the Lateran council in 1215 decreed that no new order should be established. Yet the same period witnessed the birth of a new class of orders, the mendicants (Franciscans, Dominicans, Carmelites, Augustinians, and several others). The dangers to which the church was exposed on the part of new dissenting ecclesiastical bodies required a more zealous agency, especially among the lower classes. The mendicants tried to supply this want. The rapidity of their success was astonishing, and very considerable privileges were conferred on them by the popes. The Franciscans and Dominicans soon took the lead. Both created for themselves a numerous and influential party among the laity by the establishment of tertiarians, who bound themselves to the ascetic and devotional regulations of the order, without assuming its garb or entering the convent. Both secured also several chairs at the theological schools, in spite of the opposition of the secular clergy; and the most distinguished representatives of this and the following centuries (Thomas Aquinas, Bonaventura, Albertus Magnus, John Duns

Scotus, Alexander of Hales, &c.) were either Dominicans or Franciscans. Several of their members filled the highest ecclesiastical positions, even the papal chair. They raised monachism to the zenith of its power, influence, and prosperity. As Robert Grosseteste and others affirm, the mendicants owed their popularity and success to the purity of their lives in an epoch of general monastic degeneracy. But the very influence which they obtained with princes and peoples, and the wealth that was forced upon them in consequence, hastened their own decay. Toward the close of the middle ages the name monk was often used as synonymous with rudeness and ignorance. Reformatory attempts were made in every century; new orders, as the Jesuates, Brigittines, Servites, Hieronymites, and others, were founded; but their influence was weak, and frequently after an existence of 50 or 100 years they themselves departed from their primitive standard of rigid asceticism. The councils of Constance and Basel devised for a reformation of monasticism some highly important measures, which however could only be carried out in a few places. The Beghards and Beguines exhibited a freer and less hierarchical spirit; and their associational principle was further developed by the Brethren of the Free Spirit.—The reformation of the 16th century constitutes another turning point in the history of monachism. The best and most influential men in the church cordially joined in the demand for a thorough reformation; they admitted that the crisis had been in part occasioned by the corruption of the clergy, and they urged in particular the necessity of a reformation of the religious orders. The internal history of nearly every order records, at this point of time, strong resolutions in favor of an enforcement of the primitive rules. In the most powerful orders, in particular the Franciscans, the more rigorous party achieved a complete and permanent success over those inclined toward laxity, and several new reformed congregations branched off from them, among which the Capuchins were the most prominent. The council of Trent defined the usefulness of monastic establishments, and regulated their possessions, internal administration, and the election of superiors, provided for annual assemblies, and extended the rights of the bishops with regard to the inspection and superintendence of the convents. New orders also arose in the church from the very need of reform, and bore the impress of the times. The monastic institutions of former days had been, as religious communities, chiefly contemplative. Preaching, teaching, visiting the sick and poor, and similar objects formed the occupations of the new orders. The best known of these organizations are the Theatines, Barnabites, Jesuits, and Oratorians of St. Philip Neri. The French Oratorians, the Lazarists, Sulpicians, Redemptorists, Passionists, and other congregations

are of later date. In France the religious wars of the 16th century, the degeneracy of most of the monastic institutions, the quarrels between Jansenists and Jesuits, and other causes had begotten a decided aversion to monachism. This determined Vincent de Paul to found a society of regular clerks, who, under the name of Lazarists or Priests of the Mission, have wielded a great influence in France and elsewhere; and this too determined M. Olier to give a similar organization to the Sulpicians. Of all these new orders the society of Jesus has had the most celebrity. It was founded on the principle of absolute devotion to the church and its visible head the pope. No order ever carried out its fundamental principle more faithfully, and in all subsequent contests of the Roman Catholic church the Jesuits stood in the front rank. The culture of secular literature, against which in the middle ages some founders of monastic orders had expressly warned their members, showed itself after the 16th century so great a necessity, that it was practically observed by all, though but few gave it special attention. Of these few the Jesuits, the French Oratorians, and the Benedictine congregation of St. Maur hold by universal consent a prominent place among the great literary societies of the world. A more general attention was given by the religious orders to the cause of education, especially to primary instruction. Many congregations, both male and female, were instituted for this sole purpose, especially in France, and a large number of primary schools have ever since been under their direction. Foremost among these bodies, besides the Sulpicians and Lazarists, who are devoted to the education of the clergy, are those popular educators, the Brothers of the Christian Schools, the Ursulines, Visitation Nuns, and Sisters of Charity.—The great losses which the Roman Catholic church suffered by the reformation directed the attention of the monastic orders to the foreign missionary cause. Most of the great orders, especially the mendicants and the Jesuits, engaged in it with great zeal and emulation. The Jesuits took, in addition to the three common monastic vows, a fourth, binding them to go as missionaries to any country where it might please the pope to send them. The extent of their missionary operations in Europe, Asia, Africa, and America excelled anything the Roman Catholic church had done in this field before. (See MISSIONS.) The great majority of the Roman Catholic missions in all pagan countries have ever been conducted by the members of religious orders or congregations.—In the 18th century the productivity of the church, as regards monachism, greatly decreased. The Redemptorists or the congregation of the Most Holy Redeemer, founded by St. Alfonso di Liguori, sprang up during this time to fill the gap left by the suppression of the Jesuits. Most of the orders in the second half of that century made but a feeble

resistance against the all-pervading rationalism. Joseph II. suppressed all convents of monks not occupied in education, pastoral duties, or the nursing of the sick; and many Catholic writers demanded the entire extirpation of monachism as both an outgrowth and a promoter of fanaticism. Partly to this outcry, but principally to the pressure brought to bear on the court of Rome by the Catholic powers, was due the suppression of the Jesuits in 1773. The French revolution soon afterward endangered the existence of monachism in most of the European states, but with the downfall of the Napoleonic rule its prospects began to brighten. Pius VII. in 1814 restored the Jesuits, who rose again to considerable influence, wherever they were not forcibly suppressed. (See JESUITS.) In the countries of the Latin race, both in Europe and America, the fate of monachism was closely allied with the political strife of the conservative and the liberal parties, the former patronizing it, the latter subjecting it to prohibitive rules or suppressing it altogether. In Portuguese and Spanish America the suppression of the Jesuit schools in the last century had left the upper classes and the clergy in particular with very inadequate means of higher education. The ignorance and corruption which soon crept into conventual establishments served as a powerful argument for their gradual suppression during the present century. In Italy the great wealth of the monastic bodies, and the belief that they had outlived their period of utility, caused their final abolition in 1873. They may also be said to have been extinct in Portugal since 1834, and in Spain since 1835. In France alone the vicissitudes of political rule in no way affected the growth of monastic institutions. Since 1848 even the liberals have accustomed themselves to accord the right of association to the members of religious orders. Nearly every one of the old orders reestablished itself in France; and as a number of new congregations were formed, there is at present a greater variety of monastic institutions in that country than any other state has ever possessed. Next to France, they are most numerous, wealthy, and influential in Belgium, where, as in France, public instruction is to a great extent under their control. According to the official census of 1866, there were in Belgium 178 communities of men with 2,051 members, and 1,144 communities of women with 15,205 members. They partook, throughout the British possessions, the United States, and Holland, of the blessing of truly liberal institutions, and peaceably lived in accordance with their rules, from which public opinion demanded only one departure, that no member wishing to leave their establishments should be restrained from doing so. Austria protected them, but kept them till 1848 under a bureaucratic guardianship, which has since been abandoned. In 1873 the number of convents and monasteries in that empire was about 950, with 8,500 monks

and 5,700 nuns. The revolution of 1848 procured them freedom in many other German states where before they had been either suppressed or tolerated under great restrictions; and even those states whose codes retain laws against their admission in general, as Sweden, Denmark, and Saxony, admitted the sisters of charity. But in 1873 the German imperial diet suppressed the Jesuits, Redemptorists, brothers of the Christian schools, and sisters of charity. The Russian government has also practically extinguished all Roman Catholic establishments; but Turkey has become a prominent field for their missionary operations.—The number of monastic associations founded since the beginning of the 19th century exceeds the number founded during any other period of equal length. Most of them belong to France, and several have already attained a considerable extension. A peculiar feature which characterizes them as the offspring of the present age is, that they aim at providing for the needs of the people. A large number of them are devoted to the instruction of youth. Such are the "Ladies of the Sacred Heart," and several congregations of school brothers and school sisters. Many others bind themselves to the service of the sick and the poor, as the "Little Sisters of the Poor," the most numerous and popular of them. Not a few cultivate the mission field; either the foreign missions, as the Pious society, the Oblates, the brothers and the daughters of Zion (both for the conversion of Jews, the latter consisting exclusively of converts); or the home missions, as the Paulists, established in 1858 at New York. The general advance of culture has deprived the religious orders of the monopoly of education and their former scientific preëminence. Still the Jesuits' schools in Italy, Germany, France, and England are not unworthy of their former reputation. In respect to their moral condition, Roman Catholics admit the existence in some places of considerable degeneracy. In some convents also the ancient constitutions have fallen more or less into disuse. The regular connection of the general superiors with their subordinates has been in great part interrupted, and the holding of general assemblies has ceased. Pope Pius IX., at the beginning of his pontificate, proclaimed it as one of his chief tasks to carry out a thorough reform of monastic orders; and in some orders, as the Dominicans, an extensive reformation has since taken place. The aggregate number of men belonging to the various religious orders and congregations in 1862 was about 120,000; the communities of women contained 189,000.—The reformation of the 16th century rejected the monachism of the Roman Catholic and the eastern episcopal churches. In the church of England and the Protestant Episcopal church in the United States, sisterhoods and even brotherhoods have been formed at various times, and have of late increased in number under the auspices of what is commonly called the high church par-

ty. Since the beginning of the 19th century both the "Evangelical" and the "High Lutheran" schools of Germany have approved of the establishment of houses of deacons and deaconesses, also called brother houses and sister houses, the inmates of which associate for the purpose of teaching, attending the sick, taking charge of public prisons, &c. Institutions of this kind are rapidly spreading in Germany and the adjacent countries. (See DEACONESS.)—The most important works on the history of monachism in general are: Hospinian, *De Monachis libri VI.* (Zürich, 1588, 1609); Hélyot, *Histoire des ordres monastiques* (Paris, 1714-'19; new ed., with an additional vol. on the modern history of monachism, by Migne, 4 vols., 1849); and Döring, *Geschichte der Mönchsorden* (2 vols., Dresden, 1828). The most comprehensive work on the subject is Montalembert's *Les moines d'Occident* (3 vols., Paris, 1860-'67; 3d ed., 1868; English ed., Edinburgh, 1861-'7; German ed., Ratisbon, 1868). Another extensive work has long been in preparation by Dom Gueranger, superior of the French congregation of Benedictines. (See RELIGIOUS ORDERS.)

MONACO, a small principality of Italy, bounded S. by the Mediterranean, and surrounded on all other sides by the French department of Alpes-Maritimes, between Nice and Ventimiglia. At present it consists only of the town of Monaco and a small portion of the adjoining territory, including the town of Monte Carlo; total area about 6 sq. m.; pop. in 1867, 3,127; of the town, 1,887. It formerly extended about 5 m. along the coast and about 3 m. inland, and consisted of the communes of Monaco, Mentone, and Rocca-bruna. The principal products are fruit and oil. The Genoese family Grimaldi was in possession of this territory under the protectorate of various governments from the 10th century until the early part of the 18th, when, by the marriage of the sole heiress of the name, it passed into the hands of Jacques de Goyon-Matignon, count of Thorigny. Under his grandson Honoratus IV. it was united with the French republic in 1793, but was restored to him and placed under the protection of Sardinia in 1815. The latter government acknowledged the independence of the principality, and reserved to itself only the power of garrisoning it and of appointing the military commander of the town of Monaco. Florestan I. protested in vain in 1848 against the annexation of the communes of Mentone and Rocca-bruna by Sardinia, and opened negotiations with foreign governments for the sale of his rights. He died in Paris, June 20, 1856, and was succeeded by his son under the name of Charles III., who in 1861 ceded to France his claims upon Mentone and Rocca-bruna, receiving an indemnity of 4,000,000 francs. In 1868 the pope separated Monaco from the diocese of Nice; in return for which the prince agreed to establish a Benedictine abbey, the abbot to exercise episcopal functions in the principality.

In 1869 he abolished all taxes, and his revenue is now derived entirely from the rent of the casino where gaming is carried on. The climate is considered very favorable for persons



Monaco.

afflicted with pulmonary complaints, and it has become a rival of Nice as a watering place.

MONAD (Gr. *μονάς*, unity), in philosophy, a word used by the Neo-Platonists of the early ages of Christianity, and especially by Origen, to express an idea of Divinity, and also the union of the Divine Spirit with matter. According to them, the soul was created before all other beings, and, being made divine by the knowledge of the monad, became Christ; a doctrine which, according to some writers, is the basis of Arianism. Long after this the word was used by Leibnitz to designate the primordial elements of all matter. According to him, monads are material points, possessing different degrees of consciousness and intelligence. The monad is simple, without extent, incorruptible, and so constituted that its whole future is contained in its beginning. (See **LEIBNITZ**.)—In the new chemistry the monatomic elements, such as hydrogen, chlorine, and potassium, whose molecules are capable of uniting only with single molecules of other elements, are called monads; while other elementary molecules, from their capacity to unite with two or three more molecules, are called diads, triads, &c. (See **ATOMIC THEORY**).—A number of infusorial organisms have received the name of monads. Some of these manifestly belong to the animal kingdom, some to the vegetable, while of others it is difficult to say to which kingdom they belong. The first classification was by the Danish naturalist O. F. Müller, who arranged under the same genus (*monas*) the mere moving specks that are developed in infusions, whether in vessels allowed to stand, or placed between slips of glass under the microscope, and also certain of the

most elementary and smaller of the ciliated infusoria, of which the *monas lens* is the most abundant representative. Ehrenberg in a subsequent classification placed certain organisms containing cells in their interior among polygastric infusoria, and called them monads. More recent observers regard them as belonging to the vegetable kingdom, ranking them among the algæ. The development of the *monas lens* from *bacteria*, and their subsequent transformation into *amæbæ*, and finally into *bacteria*, is a subject of rare interest, which has been pursued by Haeckel, Pineau, Pouchet, Bastian, and others. (See **ANIMALCULES**, **INFUSORIA**, **PROTOPLASM**, and **SPONTANEOUS GENERATION**.)

MONADNOCK, **Grand**, a mountain in Cheshire co., New Hampshire, near the S. W. corner of the state. The base covers an area of 5 m. by 3, and the altitude is 3,186 ft. above the level of the sea. Several minerals are found on and around the mountain, and it contains talc, mica, and slate, distinctly stratified. From a distance, its summit appears of a rounded form, free from rocks and mural precipices. Many streams of water issue from Grand Monadnock, and from its top 30 ponds are visible, some of them large enough to contain islands of 8 or 10 acres.

MONAGHAN, an inland county of Ireland, in the province of Ulster, bordering on Tyrone, Armagh, Louth, Meath, Cavan, and Fermanagh; area, 498 sq. m.; pop. in 1871, 112,785. The surface is in general hilly, except in the S. E., which is level, and forms the northern limit of the great central plain of Ireland. The principal mountains are the Slieve Beagh range, whose highest summit is 1,254 ft. above

the sea. The chief rivers are the Blackwater, Fane, Glyde, and Finn. There are several lakes, the largest being Muckno, or Barrac Lough, which is about 3 m. long and 1 m. broad. The soil is moory and peaty in the elevated districts, but fertile in the central and southern. The staple manufactures are linen, woollen, and earthenware. The minerals are iron, lead, coal, slate, marble, and building stone. The chief towns are Monaghan, the capital (pop. about 4,000), Clones, Castle Blaney, and Carrickmacross. It is traversed by the Ulster canal and various lines of railway. The county was a part of the grant made by Henry II. to De Courcy, was recaptured by the native chiefs, and in the reign of Elizabeth was erected into a shire.

MONASTERY (Gr. *μοναστήριον*, a house of retirement), the place in which monks or nuns live in seclusion. (See **MONACHISM**.) In the beginning monasteries were to be found only in solitary places; after a time some were built outside the walls of cities, and after the 5th century the cities themselves became the abode of cenobites. The growth of monasteries for women kept pace with those for men. St. Anthony built one for women in Egypt and placed his sister over it; St. Pachomius did the same in Palestine. St. Basil erected several similar houses in Pontus and Cappadocia. At Rome St. Constantia founded one near the church of Santa Agnese, and Marcella another near that of San Lorenzo. At the same epoch St. Eusebius of Vercelli built a monastery for women near his cathedral, and St. Ambrose another in Milan; and St. Augustine a little later placed his sister at the head of a monastery in Africa. Similar establishments increased rapidly in western Europe. In both the East and the West the great religious orders had numerous though separate houses for both sexes. The western monasteries of the middle ages became, like those of Egypt and Palestine, so many little towns, containing all the industries necessary for their own subsistence. Not unfrequently, too, the neighboring peasants drew from the monks the necessaries of life and built their huts in close proximity to them. Such were the famous convents of St. Gall, Fulda, Cluny, Cîteaux, and Clairvaux, as well as the great monastic establishments of the British isles; and such are still the monasteries of the East.—These houses are called abbeys when governed by an abbot or abbess, priories when ruled by a prior or prioress; and when the superior has no such distinctive title, the house is called simply a monastery, convent, or nunnery.

MONASTIR, or **Bitolla**, a town of European Turkey, in the vilayet of 80 m. W. N. W. of Salonica; pop. about 35,000, chiefly Greeks and Bulgarians. It is situated in the valley of a tributary of the Vardar, 1,700 ft. above the sea, and surrounded by lofty mountains. The town contains many mosques and a fine bazaar with thousands of shops. It has in recent

times considerably increased in importance as a great military and commercial centre. Large quantities of manufactured goods are imported from Salonica, Constantinople, Belgrade, Trieste, Vienna, and other places, and exported to the interior. A Turkish governor and a Greek metropolitan bishop reside here; the diocese is still called Pelagonia, the ancient Greek name of the district.

MONBODDO, James **Barnet**, lord, a Scottish jurist, born at the family seat of Monboddoo, in Kincardineshire, in 1714, died in Edinburgh, May 26, 1799. He graduated at the university of Aberdeen, and was sent to Groningen to study law. In 1738 he returned to Scotland, and practised at the bar till 1767, when he was made a judge. His principal works are: "A Dissertation on the Origin and Progress of Language" (6 vols. 8vo, 1774–92), and "Ancient Metaphysics" (6 vols. 4to, 1778). He especially admired the civilization of Greece, but maintained that the savage state was happiest, that men originally possessed no higher faculty than beasts, and that the orang outang is of the human species.

MONBUTTOO, a country of central Africa, bordering on Nyam-nyam, Moruoo, and Akka, between lat. 3° and 4° N., and lon. 28° and 29° E.; area, about 4,000 sq. m.; pop. estimated by Schweinfurth in 1870 at 1,000,000. It is generally a table land 2,500 to 2,800 ft. above the sea, with gentle elevations in some places 100 ft. above the beds of the streams. It is traversed in the north by the Keebaly river, which is joined by the Gadda flowing in from the southwest. They form the Welle, which proceeds west along the southern portion of Nyam-nyam, and is enlarged by numerous tributaries, finally forming in its upper course the more easterly of the two arms, which, uniting in Baghirmi under the name of Shary, are the source of Lake Tchad. The country is described as very beautiful, with vast groves of plantains, oil palms, and other trees, and a delightful verdure. The spontaneous production of fruits and tubers in profusion limits cultivation to the narrowest bounds, and almost the only products requiring attention are sesame, ground nuts, sugar cane, and tobacco. The breeding of cattle is not practised by the Monbuttoo; vast numbers of goats are stolen from their neighbors, but there is no attempt to rear them; and, excepting dogs and poultry, they have no domestic animals. The people are of a lighter tint than other known nations of central Africa, and Schweinfurth compares the color of their skins to that of ground coffee. They differ from other negroes also in the greater length and curve of the nose. Weaving is unknown to them; the men clothe themselves with the bark of the fig tree, and the women go almost entirely naked. They practise circumcision, and polygamy is unlimited. They are ingenious workers of copper and iron, expert wood carvers, and display some facility

in the manufacture of pottery. Their hunting expeditions supply them with a great abundance of wild meat; but, according to Schweinfurth, their cannibalism is "the most pronounced of all the known nations of Africa." An important article of traffic is ivory, which is a monopoly of the king.

MONCK, an electoral district of Ontario, Canada, in the S. part of the province, bordering on Lake Erie; area, 373 sq. m.; pop. in 1871, 16,179, of whom 5,758 were of German, 5,046 of English, 3,080 of Irish, and 1,570 of Scotch origin or descent. It comprises parts of the counties of Haldimand, Lincoln, and Welland, and is traversed by the Grand Trunk, Canada Southern, and Great Western railways.

MONCREIFF (Wellwood), Sir Henry, a Scottish divine, born at Blackford, Perthshire, Feb. 6, 1750, died in Edinburgh, June 14, 1827. He was the son of the Rev. Sir William Moncreiff, and assumed the name of Wellwood in the latter part of his life. He was educated at Glasgow and Edinburgh, was ordained in 1771, and was minister in Blackford as successor of his father till 1775, when he was appointed minister of St. Cuthbert's, Edinburgh. He early connected himself with the evangelical party in the church, and became in time its leader. His principal works are: "Discourses on the Evidence of the Jewish and Christian Revelations" (Edinburgh, 1815); "Account of the Life and Writings of Dr. John Erskine" (1818); and "Sermons" (3 vols. 8vo, 1829-'31), with a memoir by his son.

MONCTON, a town and port of entry of Westmoreland co., New Brunswick, Canada, at the head of navigation on the Petitcodiac river, and on the Intercolonial railway, 89 m. N. E. of St. John; pop. in 1871, 4,810. It is beautifully situated and has a fine harbor. The number of vessels cleared during the year ending June 30, 1873, was 17, of 1,563 tons; entered, 16, of 1,357 tons; value of exports, \$15,321; imports, \$108,037. The town contains the general offices and principal workshops of the railway, and has manufactories of iron castings, steam engines, machinery, tobacco, leather, wooden ware, &c., two branch banks, several hotels, a weekly newspaper, a telegraph office, and four churches.

MONDAY (Lat. *Luna Dies*, Fr. *lundi*, Ger. *Montag*, the day of the moon), the second day of the week, which derives its designation from the Romans, who gave the names of the sun, moon, and five planets to the seven days in modern use.

MONDOÑEDO, a city of Galicia, Spain, in the province and 30 m. N. N. E. of the city of Lugo; pop. about 7,000. It is built in the form of an amphitheatre on the slope of three mountains, one of which is the Monte Infesta, at the edge of an oval valley, watered by three streams, tributaries of the Masma. The streets are irregular, and the houses mainly of antiquated appearance. The walls are in good preservation. The cathedral, begun in 1221, is

a massive Corinthian structure. An ancient castle stands on an eminence, and its batteries command the town. The chief occupations are agriculture, cattle rearing, cotton and linen weaving, and tanning. The French sacked Mondoñedo in 1809.

MONDOVI, a town of Piedmont, Italy, in the province of Coni, on the right bank of the Ellero, 1,810 ft. above the sea, and 53 m. W. of Genoa; pop. about 10,000. It is partly on a hill, is walled, and has a citadel. The streets are adorned with many handsome edifices, among which is the cathedral of San Donato. It is the seat of a bishop, and has two gymnasia, a technical school, an episcopal seminary, and other schools and charitable institutions. The manufactures are of woollens, silks, &c. The city was founded in the 12th century by the people of the surrounding villages, as a place of refuge during the civil wars. It remained an independent republic till 1396, when it submitted to Amadeus of Savoy, titular prince of Achaia. On April 21, 1796, it was the scene of a battle between a portion of Bonaparte's army and the Sardinians under Colli, in which the latter were defeated with the loss of 2,000 men and 8 guns. In 1799 the city was fearfully punished for rising against the French.

MONE, Franz Joseph, a German scholar, born at Mingolsheim, Baden, May 12, 1796, died in Carlsruhe, March 12, 1871. He studied at Heidelberg, and was professor there till 1827, when he became professor of statistics at Louvain; but after the revolution of 1830 he returned to Heidelberg, and in 1835 became director of the Baden archives. His works include *Geschichte des Heidenthums im nördlichen Europa* (2 vols., 1822-'3); an edition of *Reinardus Vulpes* (Stuttgart, 1832); *Uebersicht der niederländischen Volksliteratur älterer Zeit* (Tübingen, 1838); and *Die gallische Sprache und ihre Brauchbarkeit für die Geschichte* (Carlsruhe, 1851).

MONEY (Lat. and Ital. *moneta*), the currency of the realm or of the country; the standard of payment, whether of coins, circulating notes, or any other commodity. Anything which freely circulates from hand to hand, as a common, acceptable medium of exchange in any country, is in such country money, even though it cease to be such, or to possess any value, in passing into another country. In a word, an article is determined to be money by reason of the performance by it of certain functions, without regard to its form or substance. Money has been termed by Mr. Henry C. Carey "the instrument of association," and the same writer has said of it that it is "a saving fund for labor, because it facilitates association and combination, giving utility to billions of millions of minutes that would be wasted did not a demand exist for them at the moment the power to labor had been produced." Baron Storch terms money "the marvellous instrument to which we are indebted for our wealth and civilization." Mr.

Thorold Rogers has said: "Just as the development of language is essential to the intellectual growth of a people, so is a medium of exchange to civilization." Aristotle says of it, "that it exists not by nature, but by law." How true is this doctrine, or at least how potent is the law under a civilized government in imparting the quality of acceptability for the payment of debts and the purchase of commodities to that which it recognizes as money, is clearly proved by the operations of the bank of Venice during several centuries, throughout which time its deposits, which were never payable, but only transferable on the books of the bank, were at a premium over coins, because they were the standard of payment furnished by the state and used for all large transactions. Indeed, this bank money was that which established the money of account and in which the value of all coins was expressed. Further, on the testimony of Thomas Baring, we are assured that it was found impossible during the crisis of 1847 in London to raise any money whatever on a sum of £60,000 of silver. During a similar crisis in Calcutta in 1864 it was equally impossible to raise even a single rupee on £20,000 of gold. The former was not a legal tender above 40 shillings, while the latter was not so for any sum whatever. About 1855 Holland adopted silver as the only legal tender at a fixed value, but attempted to coin gold coins having no such value, this only being regulated by the market price from day to day. After 200,000 florins (about \$80,000) had been coined, the demand entirely ceased. —Very dissimilar substances have been made to serve as money. The Jews, in addition to their ordinary money of shekels, talents, and drachms of silver, had "jewel money." Cattle were used as money in ancient Greece and in Rome; and hence the word pecuniary, from *pecunia*, and this from *pecus*, cattle. Before the introduction of coined money into Greece there was a currency of "spits" or "skewers," of which six were a drachm (*δραχμή*, originally *δραχμή*, a handful); they were probably nails of iron or copper. The Lacedæmonians and Byzantines and the people of Clazomenæ used iron money. Among the most ancient existing specimens of coin are those of *electrum*, an alloy of gold with one fifth silver. Gold, silver, and copper were coined by the Greeks and Romans. Tin was coined by Dionysius I., tyrant of Syracuse, and Roman and British tin coins are known to exist. Early leaden money is mentioned; a leaden stater is preserved in the British museum, and leaden money is now current in the Burman empire. Platinum was coined in Russia from 1828 to 1845. Numa Pompilius, king of Rome about 700 B. C., made money both of wood and of leather. Under the Cæsars lands were made money. The Carthaginians had a kind of leather money. The emperor Frederick Barbarossa during his contest with Milan (1158-'62), and John the Good, king of France (1360), also issued leather

money. Under William I. of Sicily (1154-'66), the Sicilians were compelled to give gold and silver in exchange for leather money. In 1574, when the city of Leyden was besieged by the Spaniards, leather money was issued. The British museum has a specimen of a sequin in leather of Francesco Cornaro (1656). In the 13th century Nicolò and Matteo Polo found a money in use in China which was made of the middle bark of the mulberry tree, cut into round pieces and stamped with the mark of the sovereign; this money it was death to counterfeit or refuse to take in any part of the empire. In Britain, at as late a date as the Norman conquest, two kinds of money were in use, known as "living money" and "dead money." The former consisted of slaves and cattle, which were usually transferred with the soil, and the latter of metal. Montesquieu notices the existence among the inhabitants of the coast of Africa in the 18th century of an "ideal money," "a sign of value without money," the unit being the *macoute*, which was subdivided into tenths called pieces. This money of account had its origin, as appears from later testimony, in the *macoute*, a piece of stuff, a fabric; and Mungo Park says that in the early intercourse of the Mandingos with the Europeans, the article which attracted most attention was iron, on account of its high utility in making implements of war, &c. Iron soon became a standard of payment, and gave rise to a money of account; and any commodity which was supposed to be of the value of a bar of iron was called a bar, as a bar of tobacco, &c. When the South sea islands were discovered the natives first exchanged their products with the Europeans for beads or anything gaudy which was offered to them; but they soon discovered the value of iron utensils, and they now freely exchanged anything they had for axes, hammers, nails, &c. Axes were eventually held in such estimation that they became a standard of payment and the basis of a money of account, the value of other articles being stated at so many axes. Cowry shells (*cypræa moneta*) are used in India, the Indian islands, and Africa, in the place of small coin. In 1851 more than 1,000 tons were brought from India to Liverpool to be exported to the coast of Africa in exchange for palm oil. In Bengal a century ago 2,500 cowries were worth a rupee (46 cts.), and at the present time 3,200 are worth this sum. According to Dr. Barth, in Bornoo, central Africa, the ancient standard of the country was the pound of copper; but it has long since fallen into disuse, although the name *rotl* still remains. The prices of commodities are still reckoned in the *rotl*, although cotton strips and shirts, cowries, and Austrian and Spanish dollars have become the mediums of exchange, their value being expressed in *rotls*. In India cakes of tea, and in China pieces of silk, pass as money. Salt is the current money of Abyssinia, codfish of Iceland and Newfoundland. At the great fair

annually held at Nizhni Novgorod in Russia, the price of tea has first to be made known before the prices of other commodities are fixed, it thus becoming a standard by which all exchanges of merchandise are regulated. The skins of wild animals were used as money by the ancient Russians and by some of the Indians on this continent; and even by the people of Illinois at an early day raccoon and deer skins were so used. In 1574 quantities of pasteboard were coined in Holland. Of the aboriginal money of the American continent, from the mounds in and adjoining the valley of the Mississippi, specimens have been obtained composed of lignite, coal, bone, shell, terra cotta, mica, pearl, carnelian, chalcedony, agate, jasper, native gold, silver, copper, lead, and iron, which were fashioned into forms evincing considerable skill in art. Cocanuts were used as money in certain parts of the American continent when the Europeans first visited it. Wampum was used by the Indians as currency, and about 1635 was the prevailing one among the colonists of Massachusetts, was a legal tender, and was even counterfeited. About the same time corn and beans were used, and indeed a general barter currency was in vogue, and musket balls passed for change at a farthing apiece, and were a legal tender for sums under one shilling. Codfish was also used. The accounts of the New Netherlands were in 1662 kept in wampum and beaver skins; and in Virginia about the beginning of the 18th century the receipts, issued for tobacco deposited in warehouses passed current as money. Adam Smith mentions that in Scotland about 1776 it was customary for workmen to carry nails as money to the bake shop and the ale house. Notched wood was used at one time in England. "In the British West India Islands," says Mr. Madden, author of "Coins of the Jews," "pins, a slice of bread, a pinch of snuff, a dram of whiskey, and in the central part of South America soap, chocolate, cocoanuts, eggs," &c., serve the same purpose. Association with his fellow man being one of the first and most imperative needs of man, he thus finds, amid a variety of things, some one or more which will serve as the instrument of association.—R. H. Patterson, an eminent Scotch writer, has traced the origin of metallic money in the East through the tendency of man in the then primitive state of society to accumulate the precious metals at a time when there was little wealth beyond that of flocks and herds, crops of grain, and other personal property; and he goes on to say: "Next, as all men valued these metals, kings began to collect their revenues in that form. They coined the metal and made it receivable as tribute or taxes. This fully established the exchangeable value of the precious metals. It created a new demand for them, it rendered them indispensable in a department of national life where they had not previously been required; thenceforth all men needed

them every year to pay the king's dues. Thus they became a circulating medium." A man who had more oxen or grain than he needed for his own use, sold those commodities to others, receiving coins in return, which coins he could store for ever, which were useful to pay taxes, and when he so needed to purchase the labor or productions of others." "But," he adds, "the invention of money by no means put an end to payments in kind and the process of barter. It only supplemented them. Even in England until the reign of Edward I. the taxes were paid in kind to a large extent, if not entirely; and to a much later date military or other personal service to the state was accepted in lieu of taxes of any kind." As monarchs originally established coinage, so throughout all subsequent time the monarch or the state has claimed as among the highest of his or its prerogatives all control over "the current money of the realm." With coins this function has almost universally been directly exercised by the supreme authority, while with circulating notes, the prerogative still being claimed, the exercise of the function of issue has generally been delegated to banks. The earliest recorded mention of the precious metals is found in Gen. xiii. 2, when Abraham returned from Egypt "very rich in cattle, in silver, and in gold." In xvii. 12 we find the expression, "he that is born in the house or bought with money of any stranger." The earliest account of a purchase and sale is given in Gen. xxiii., when Sarah the wife of Abraham being dead, he bought from Ephron a field in Machpelah for a burial place for her, and he "weighed to Ephron the silver which he had named in the audience of the sons of Heth, four hundred shekels of silver, current money with the merchant." It will be observed that this current money was not counted, but was weighed, the money of that day being pieces of silver cut to certain weights, as shekels and talents, but not coined.—The invention of coinage has been attributed to the wife of Midas, a legendary king of Phrygia, although it is quite probable that this was merely the introduction of the art from some other country more advanced in civilization. By some of the highest authorities the balance of testimony at present existing, so far as it can be traced, is regarded as in favor of the Lydians (about 1200 B. C.) as the inventors, and with this view both Herodotus and Xenophanes of Colophon agree. In the opinion of Mr. Madden, the earliest electrum coins have the appearance of greater antiquity than any in the whole Greek series; and it seems more probable that the invention was of Asiatic origin, as the part of Asia to which this electrum class belongs was at this early period subject to the Lydian kings. By some Greek writers the invention is attributed to Phidon, king of Argos in the 8th century B. C., and by others to the people of Ægina. Phidon is now believed only to have introduced coinage into Greece. We are assured

that the native bronze coin of China, the *tsien* or *cash*, bearing the inscription *tung-pan*, i. e., current money, had its origin about 1120 B. C., at the beginning of the Chan dynasty. The original coins of Asia Minor were of gold or electrum (a mixture of gold and silver), and those of Greece of silver; while in Rome for nearly 500 years after its foundation no metal was coined but copper or brass. The *as*, *as*, or *libra*, a pound weight of copper or brass, was stamped by the state in the reign of Servius Tullius (578-534 B. C.). This coin, the unit of Roman money, was originally oblong like a brick, but subsequently was made round, and was cast, not struck. Before this reign they used for money unstamped bars of copper. According to Pliny, silver was first coined at Rome in 269 B. C., the principal coin being the *denarius*; and gold in 207, although it is believed that the latter did not form a part of the ordinary and regular currency of the country until the time of Julius Cæsar, about 49. The emperors possessed the privilege of coining gold and silver, but copper could only be coined *ex senatus consulto*.—At the date of the invasion of Britain by Cæsar, 55 B. C., the ancient Britons had money of brass and iron, and it was paid by weight. During the reign of Augustus, Cunobelin, one of the native kings, had established his mint at Camulodunum (Colchester), where he caused to be coined money of gold, silver, and brass. Under the emperor Claudius the coinage of the Romans took the place of that of the natives, and circulated until after the abandonment of the country by the conquerors in the 5th century. The earliest coins of England subsequently issued are supposed to be the pennies of Æthelbert, king of Kent (560-616). These were coarsely stamped with the king's image on one side and either the name of the mint master or the city in which they were coined on the other. At this time all money accounts began to be expressed in pounds, shillings, pence, and mancuses or mancusæ, although there was no coin but the penny, all other denominations being mere monies of account; 30 pence made a manca, 5 pence a shilling, and 40 shillings a pound. The mancuses were reckoned both in gold and silver. In King Canute's laws the distinction is made that a *mancusa* was as much as a mark of silver, while a *manca* was a square piece of gold valued at 30 pence. King Athelstan (930) decreed that money should be uniform and only coined in towns, and this decree mentions the fact that the clergy shared with the king the privilege of coinage. The Norman kings continued the practice of coining only pence, which were of silver, and with a cross so deeply impressed that they might easily be broken into halfpence and farthings. The date of the earliest use of the word *sterling* to denote the standard money of England has given rise to much learned discussion; but it has been well established by the testimony of the chronicler Ordericus Vitalis (1075-1143)

that it was used as early as during the reign of William the Conqueror. The etymology of the word is by no means so certain. Henry I. in 1108 attached severe penalties to the counterfeiting of money, and during this reign halfpence were first regularly coined. At the commencement of his reign (1154) Henry II. found the money so much debased and reduced in value from various causes, that he provided for a new coinage, and punished those convicted of tampering with it. In 1222 silver farthings were coined. In 1248 it was found that the money of the realm had been so clipped and otherwise defaced that its real worth bore no fixed proportion to its nominal value. Henry III. therefore ordered that the old coins should be brought to the mint and exchanged for new ones, weight for weight; thus entailing the entire loss, which was very great, upon the then present holders of these coins, which justly caused great complaint. During this reign, in 1257, gold pennies were first coined, which weighed $\frac{1}{16}$ of a pound tower, and passed for 20d. In 1279 Edward I. caused a new coinage of halfpence and farthings to be made, providing at the same time that the old, which were principally mere fractions cut to suit, should no longer pass current. Twenty years subsequently, and during the same reign, so much trouble and loss were suffered from foreign coins of inferior value, known as "pollards," "crockards," &c., that it was decreed that all importers of such money should be punished by death and the confiscation of their property. All persons arriving from abroad were to be searched, and those having such money were to be immediately imprisoned. All good foreign money was to be taken forthwith on its arrival to the exchange, and all false English money imported was to be seized. No person was allowed to sell wool, hides, skins, lead, or tin, except for good sterling money, silver stamped at the king's exchange, or for a good and sufficient quantity of merchandise; and no money or bullion was to be taken out of the dominions without a license from the king, under penalty of seizure. Persons going abroad, or coming to England, were to be furnished at Dover with a quantity of money of the country to which they were going, sufficient to pay their expenses. The following year (1300) Edward positively prohibited the circulation of any money not of his own coinage. In 1301 he diminished the weight of the pound sterling three pennies, equal to one per cent. This was "a departure from the ancient strict and honorable adherence to the integrity of the national money; and a breach, once begun, was with less scruple enlarged by the succeeding kings." Edward II., having married a daughter of the king of France, gave permission to the French merchants to trade with England, and return with their goods and money, notwithstanding the edicts of preceding monarchs against the exportation of coin and bullion. In the reign

of Edward III. (1335), among the extraordinary means taken to prevent the importation of money of foreign coinage from abroad, may be mentioned that of obliging innkeepers to be sworn to search their guests for the detection of such money. Exchanges were established at Dover, London, Yarmouth, Boston, Kingston, and Hull, for furnishing to travellers going abroad foreign money. This monarch, having by 1344 exhausted his exchequer, and embarrassed himself with debts, in his unsuccessful attempts to conquer France, ordered that in future 266 pennies should be made from the pound sterling. Two years subsequently he increased the number to 270 pennies. In 1394 it was decreed that no silver money should be melted for the manufacture of plate or for any similar purpose. Counterfeiting of English money would seem to have been a very common practice in those days; and in 1416 parliament passed an act declaring it treason to counterfeit the money of the kingdom, and providing for the punishment by the judges of importers of base coin. Five years later the currency was in so bad a state that a law was passed by parliament providing that all gold money should be passed only by weight, and that all light and vitiated coins should be taken to the tower to be recoined. In consideration of the loss sustained by the holders, the king remitted the usual charge for coinage. In the reign of Henry VII. (1504) a law was passed against either taking English money into Ireland, or bringing Irish money into England. The following year a trifling number of shilling pieces were coined, being the earliest known to have been made. Under Henry VIII. enactments against the exportation of money, plate, and jewels were again passed; and in this reign (1523) silver farthings were coined for the last time. In the reign of Edward VI. (1551) the currency reached its worst condition of depreciation, and was "in such a state of confusion and fluctuation, that the sellers scarcely ever knew what value they were to receive for their goods," when the king applied active and vigorous measures for correcting the evil by raising the standard. Queen Elizabeth signalized the beginning of her reign by raising the silver coin to a higher standard of purity than had been known since the accession of Henry VIII. In 1601 she caused to be coined for Ireland shillings, sixpences, and threepences of a baser kind, and established offices for exchange between the two countries. For many years the tradesmen of London had made and issued leaden tokens, which circulated instead of copper coins. This circulation was to a great extent stopped about the beginning of the 17th century by the government, and the more general use of regular coins gradually took their place. James I. in 1613 debased a portion of the coin, having coins in circulation of two qualities of fineness. In 1627 Charles I. issued a proclamation, saying in effect that the buying, selling, and exchange-

ing of all manner of coins and bullion were prerogatives of the crown, which from that time forth he intended to exercise; he interdicted the goldsmiths from pursuing the business in any of its branches, and appointed Lord Holland and his deputies to have "the office of our changes, exchanges, and outchanges whatsoever in England, Wales, and Ireland." In 1632 he granted permission to the East India company to export to Persia and India £40,000 in foreign gold bullion; and being desirous of cultivating friendly relations with Philip IV. of Spain, he authorized under certain restrictions the export of the precious metals to the Spanish Netherlands. According to Davenant, the entire gold and silver coinage of England for 100 years, from 1558 to 1659, was: of gold £3,723,000, and of silver £16,109,476, making in all £19,832,476. By the same authority it is estimated that in the year 1600 the total amount of gold and silver currency in England did not exceed £4,000,000, and that in 1711 it did not exceed £12,000,000. In 1676, Charles II. being then on the throne, the money coined during the commonwealth and protectorate was called in and recoined. This amounted to £800,000; and by estimating that coinage at one seventh, and giving an allowance for money hoarded, writers of that day put the total currency of the country at £6,000,000. The first copper coinage of England since the conquest was in 1672, during this reign. James II. (1685-'8) issued coins of tin, and authorized those of gun metal and of pewter. The first sovereigns were coined in 1489, under Henry VII.; half, quarter, and eighth sovereigns by Henry VIII. in 1544; and the first guinea by Charles II. in 1675.—It may be instructive here to examine into the circumstances under which Great Britain was led to adopt the gold standard, after for a century having the double standard of both gold and silver. Owing to the over-valuation of silver in France before the commencement of the 18th century, the heavy silver coins rapidly disappeared from circulation in Great Britain, only the light and worn ones remaining, often 25 per cent. below the standard. The evil became so great that it brought on a discussion during the reign of William and Mary, in which the philosopher John Locke and William Lowndes, master of the mint, took decided and antagonistic parts. The result was that the government undertook to recoin the entire remaining and worn silver currency, and to make it full weight without raising its value. This only facilitated its export and rendered it more difficult to maintain this part of the circulation, a difficulty which lasted throughout the century, the real value of the coins being so uncertain that the guinea fluctuated in price, as measured by silver, from 21s. 6d. to 30s. It was therefore in 1774 declared that silver should no longer be a tender, except by weight, beyond £25. In the words of Mr. J. R. McCulloch, "from 1717 to 1816,

no silver coins of legal weight and purity would remain in circulation, but were either melted down or exported to foreign countries." In 1816 the pound standard of silver was coined into 66s., the relative value with gold being as 1 to 14.287. Silver then became a legal tender for only 40s. and under, and has since only been coined for account of the government itself, at an apparent profit; but as the government maintains the circulation up to the standard, this profit is more nominal than real. By the currency bill of 1819, providing for the resumption of cash payments in 1823, all the old statutes against the melting and exportation of coin or plate were repealed, as well as the oath required that it was not melted plate or coin or clippings of coin. In 1792 the congress of the United States by law fixed the relative value of silver and gold at 1 to 15; and as a consequence, when a foreign balance had to be liquidated, silver being over-valued as compared with European standards, gold was exported, and it was found impossible to maintain a gold circulation. In 1834 the standard was altered to 1 to 16, while with other nations it was generally 1 to 15½. Now silver was so largely exported that the proportion was on March 3, 1853, altered to 1 to 14.83, and silver was made a legal tender only for sums under \$5. By the coinage act of Feb. 12, 1873, it was again changed to 1 to 14.95. After the discovery of gold in California and Australia the economists of Europe predicted a great decline in its value. Prominent among these was M. Chevalier, who in 1859 published a volume entitled *De la baisse probable de l'or*, which was translated into English by Mr. Richard Cobden. Under the influence of the teachings of the economists, the Netherlands, Belgium, and Germany all demonetized gold and adopted silver as the only legal tender at a fixed rate. In those countries gold only circulated as a commodity, subject to daily fluctuations in value; and as a consequence, deprived as it was of its legal support as money, it was but little used. In 1861 Belgium, "at the urgent request of her commercial and industrial interests, and in defiance of the opinion of the theorists," re-adopted gold as a legal tender. The German empire has now (1874) adopted gold alone as a legal tender, with silver only for subsidiary coinage. Denmark, Sweden, and the Netherlands have decided upon the same course, to be followed, as is believed, by Belgium. In India prior to 1835 gold and silver were both a legal tender, but silver then became the exclusive one. In 1841 the Indian government authorized gold *mohars* to be received when offered for taxes. In December, 1852, however, this was prohibited for fear that all payments might be made to them in gold, which was the cheaper metal, while they might be obliged to make all payments in silver, which was the only legal tender.—The relative values of silver and gold at different periods have been as follows:

Rome about the Christian era.....	1 to 9
England, mint price, 1344.....	1 to 12475
" " " 1509.....	1 to 11400
" " " 1600.....	1 to 11100
" " " 1717.....	1 to 13209
" " " 1816.....	1 to 15209
" " " 1863.....	1 to 15069

The relative productions of these two metals have varied from about 42 oz. of silver to one of gold in 1800 to about 63 oz. of silver to one of gold in 1863. The following table, derived from the "indentures" made with the masters of the mint, exhibits the number of pounds, shillings, and pence which have at various times in England been coined out of a pound of silver, with the standard of fineness:

DATES.	Fine silver.	Alloy.	£ s. d.
	oz. dwt.	oz. dwt.	
Before A. D. 1800.....	11 2	0 18	1 0 0
1800, 28 Edward I.....	11 2	0 18	1 0 3
1844, 18 Edward III.....	11 2	0 18	1 2 2
1846, 20 " ".....	11 2	0 18	1 2 6
1853, 27 " ".....	11 2	0 18	1 5 0
1812, 18 Henry IV.....	11 2	0 18	1 10 0
1464, 4 Edward IV.....	11 2	0 18	1 17 6
1527, 18 Henry VIII.....	11 2	0 18	2 5 0
1543, 34 " ".....	10 0	2 0	2 8 0
1545, 36 " ".....	6 0	6 0	2 8 9
1546, 37 " ".....	4 0	8 0	2 8 0
1549, 3 Edward VI.....	6 0	6 0	3 12 0
1551, 5 " ".....	3 0	9 0	8 12 0
1551, end of 6 Edward of 1552, VI.....	11 1	0 19	3 0 0
1553, 1 Mary.....	11 0	1 0	3 0 0
1590, 2 Elizabeth.....	11 2	0 18	3 0 0
1601, 43 " ".....	11 2	0 18	3 2 0

The last named proportions continued down to 1816 (56 George III.), and the standard of fineness is still the same, but the weight of the coins has been reduced, the shilling weighing but 87.43 grains, and a pound of silver thus producing 66 $\frac{18}{100}$ shillings.—Early in the latter half of the 17th century the public mind of England became deeply interested in projects for the establishment of institutions of credit which should economize the use and add to the power of the then limited metallic circulation of the realm. They had seen and appreciated how in Amsterdam the ownership of coins, and in Venice the ownership of these as well as of claims upon the state, were made to furnish the means for the adjustment of debts even more efficiently than the coins themselves, which were at the same time protected from clipping, sweating, wear, and tear; and how the bank of Genoa had even advanced beyond this, by furnishing its own notes for circulation. Indeed, they had noticed the success of the goldsmiths and other private bankers in issuing their own promissory notes, payable to the bearer on demand, as well as bonds or sealed bills bearing interest and payable at a fixed day, as currency. In 1657 Samuel Lamb, a well known merchant of London, published a pamphlet entitled "Trade, Shipping, Banks," in which he took the ground that it was desirable to establish banks; "for no nation," he says, "yet made use of them, but they flourished and thrived

exceedingly; they will, by well ordering of them, bring back the gold and silver drained out of this land by the Hollanders' banks," &c. The result of this discussion, which was continued for years, was the establishment of the bank of England in the year 1694. This institution, at once on commencing business, issued its notes payable without indorsement to the bearer on demand. Prior to this time bank notes, properly speaking, with an extended circulation without indorsement, were unknown in Europe, unless those issued in 1658 by the bank established by Palmstruck in Stockholm were of this character. The bank of England was the first in the world which agreed to issue its notes, payable on demand, in exchange for individual paper, payable at a future date. "The bank thus undertook," in the words of Stephen Colwell, "to perform an impossibility, in the hope that it would not be called upon to redeem the promise or make the attempt;" and he adds: "What the bank could do was to give its own notes of convenient denominations for circulation in exchange for individual paper, and payable at the same time as it; and in doing this alone the bank could have rendered a great service to the public with small risk." The same writer regards this step of the bank as "a Pandora's box of evils opened to trouble the commercial world," and to be the main cause of the unpopularity of banks even unto the present hour, by reason of their irregular action and instability.—In America, "the several provinces in their infancy," says Wright, the author of "The American Negotiator" (London, 1767), "had but little trade, and consequently little money. The tools, utensils, and necessaries for planting they were at first supplied with from Britain, involved them in debt before they were able to raise goods for exportation to pay their creditors; and the goods they first raised were often so ordinary in quality or so little in quantity that they were able to export to a foreign market, that the net proceeds of the same often turned out poorly; by which means the planters remained continually in debt to the British merchants, and occasioned the balance of trade to be always against them; and having neither goods nor cash sufficient to remit to their creditors, the consequence has been that many bad debts have been made and great losses sustained, as the merchants of Great Britain have but too fatally experienced." As the northern colonies improved in their condition, the British merchants received their claims in part; but this "prevented the cash staying with them" (the colonists), "and obliged them to ship it off with their other merchandise toward paying their debts." The consequences, as already shown, were that the colonists were forced to use as money wampum, musket balls, beaver skins, tobacco, corn and beans, and in fact to resort to a general barter. About the middle of the 17th century the trade with the West Indies brought into Massachusetts a con-

siderable quantity of silver, and in 1652 that colony set up a mint in Boston and commenced the coinage of the "pine tree" currency, shillings, sixpences, and threepences, and continued to do so for a number of years. This being inadequate to their wants, the barter currency continued to be used. In 1690 the first paper money was issued by the colony of Massachusetts for the purpose of paying off the troops employed in an expedition against Canada, fitted out with the hope of booty which they had failed to obtain. In 1709 another expedition was proposed by this and other colonies, and more notes were issued. In 1698 Schuyler and Dillon, who made an expedition to Canada, reported with apparent surprise that there the currency consisted only of paper. Subsequently banks were established and currency issued by the various colonies, and made a legal tender; but in 1751 legal tender for paper money in the colonies was abolished by act of parliament, and in 1763 that body declared any issue void. Nevertheless, in 1773 bills issued by any of these colonies were allowed to be legal tender at their several treasuries. When Louisburg was captured by the New England colonies in 1745, parliament ransomed the place, and the sum coming to Massachusetts, £138,649 sterling, was shipped from England in specie. This enabled the colony to retire all of her currency at the then existing rate of 11 for one, and as a consequence in 1774 she was entirely out of debt. The rate of exchange in Massachusetts in the under-mentioned years was as follows:

YEARS.	Sterling exchange in Mass. currency.	Value of an oz. of silver in currency.
1702.....	133	6s. 1½d.
1706.....	135	7 0
1718.....	150	8 0
1716.....	175	9 8
1717.....	225	12 0
1717.....	270	14 0
1728.....	340	18 0
1730.....	350	20 0
1737.....	500	26 0
1741.....	550	28 0
1749.....	1,100	60 0

The currency of Rhode Island suffered such a depreciation between 1744 and 1759, that while in the former year it required £450 to obtain £100 sterling, in the latter it required £2,300. However, in or about the year 1767, measures were taken to place the currency of some of the colonies on a better footing. The following were then the rates of sterling exchange in the provinces named: Massachusetts, 133½; New York and East Jersey, 175 to 171½; Pennsylvania and West Jersey, 165 to 160½; Virginia, 125; Maryland, 145; North Carolina, 145; South Carolina, 700; Georgia, 100; Jamaica, 140; Barbadoes, 135; Nevis and Montserrat, 175; Antigua and St. Christopher, 165.—The continental congress as originally constituted was as feeble a government as any that

can be imagined. It had no executive head and no finance minister. It was expected to and did prosecute a war against one of the most powerful nations then existing, while it had no means whatsoever of levying taxes through any officials of its own. It might only recommend to the several colonies or states to levy and collect certain taxes for its use, but it had no means for enforcing the payment of them. It however fully exercised the power to issue and borrow money, and on May 10, 1775, resolved to issue \$300,000 of bills of credit, for the redemption of which the faith of the colonies was pledged; a quota was apportioned to each colony, which was liable for the discharge of its proportion. The united colonies were however liable for any part not discharged by any colony. Legal-tender acts of the most stringent character were adopted by congress and the colonies, and subsequently by the states. No taxes were even recommended by congress to be levied until Jan. 14, 1777; but the resolution then passed was so indefinite, no quotas being named in it, that it had little or no result. By resolution of Nov. 22, 1777, the states were recommended to raise \$5,000,000, with quotas annexed; but this had very little effect, small sums only being raised and paid by some of them within the year 1778, and by others subsequently. In an address to the people, May 8, 1778, congress said: "What are the reasons of your money being depreciated? Because no taxes have been imposed to carry on the war." In 1779 immense sums were called for, for that year and for 1780—\$180,000,000 for the latter year alone; but small was the actual amount received. Before any depreciation of bills took place \$9,000,000 had been issued; but in March, 1778, \$1 in coin was worth \$1 75 in paper; in March, 1779, \$10; and in February, 1780, \$40. At this latter date \$200,000,000 had been issued, and was estimated to be worth but \$5,000,000 in coin. By the end of this year the final redemption of the bills came to be doubted, and the depreciation had reached 100 for one; by May, 1781, it was from 200 to 500 for one, and at or about this latter date they ceased to circulate as money at all. On June 2, 1781, the assembly of Pennsylvania, on the recommendation of congress, repealed all tender acts; and the same was done about the same date by all the states. The total amount of continental money issued was officially stated on Jan. 30, 1828, by Joseph Nourse, register of the treasury, at \$241,552,780, and by Thomas Jefferson it has been estimated at \$200,000,000. Early in 1780 it was stated that specie "was never more plenty or more easily collected than at that time," the plentiful supply being occasioned by the large sums coming from the expenditures of the British army in New York and of the French army and navy, and from imports from Havana. In December, 1780, Peletiah Webster, a very careful writer on finance in Philadelphia, esti-

mated the total amount of specie in the thirteen states at from \$10,000,000 to \$12,000,000. Large as this was then considered to be, it was not more than about the then annual expenditures of the government estimated in coin. This will at once and readily give an idea of the stupendous work which was undertaken by this feeble government of a poor and scattered people, and go far toward explaining the total collapse of its finances, conducted without any power of taxation, and until 1781 without system or a head. During the war the several colonies and states also issued paper money of their own, to an estimated aggregate amount between 1775 and 1783 of \$209,524,776. By resolution of Feb. 2, 1781, congress created the office of superintendent of the finances, to which on the 20th of the same month Robert Morris was appointed. On May 17 he submitted a plan for a bank, and on the 26th congress passed a resolution approving the plan, and pledging itself for its promotion, under the name of "The President, Directors, and Company of the Bank of North America," and on Dec. 31 it passed "an ordinance to incorporate the subscribers to the bank of North America." The capital was \$400,000, of which \$254,000 was subscribed by the government. This institution proved to be of very material assistance to the national finances. The first congress under the constitution in 1789 passed an act imposing duties on imports, by which the pound sterling was valued at \$4 44. There was at the time no United States coin of the denomination of the dollar, but this was merely the money of account based upon the Spanish dollar, which had long been in use in the country. Coins from all parts of the world were taken at the custom house at a statutory value. On April 2, 1792, congress passed a law organizing the mint, but permitting the circulation of foreign coins for three years, by which time it was believed the new coinage would be ready in sufficient amount. (For the provisions of this, and of prior and subsequent congressional acts relating to coinage, see COINS.) In 1791, on the recommendation of Alexander Hamilton, then secretary of the treasury, the first bank of the United States was established, and remained in existence until the expiration of its charter, March 4, 1811. During the war of 1812-'15 with Great Britain the government experienced great embarrassment in its finances, and by August, 1814, found it impossible to negotiate any further loans. In 1812 treasury notes having one year to run and bearing 5½ per cent. interest, were issued to the amount of \$3,000,000; in 1813, \$6,000,000; and in 1814, \$8,000,000. These were not a legal tender, but were receivable in payment of duties on imports and other taxes due to the general government. In October, 1814, when Alexander J. Dallas became secretary of the treasury, these notes were in such ill repute that, in the words of a historian of that period, "none but necessitous creditors or contractors

in distress, or commissaries, quartermasters, navy agents, acting as it were officially, seemed willing to accept them." Indeed, they were at a heavy discount compared with bank notes, which were not redeemable in coin; but by Jan. 10, 1815, they sold at par. The government has repeatedly since been obliged to issue treasury notes bearing interest and payable at a fixed period after date, but not a legal tender, and not generally used as currency. On April 3, 1816, a bill for the incorporation of the second bank of the United States was passed, and this institution remained in existence until the expiration of its charter in 1836. From the inauguration of the present government under the constitution, March 4, 1789, until the civil war, 1861-'5, with the exception of the circulation of the two banks of the United States, the treasury notes already mentioned, and the banks of the District of Columbia, the paper money of the country was generally furnished by banks chartered by the several states. The commencement of the secession movement in November, 1860, soon caused a financial crisis and a total paralysis of business, under the effects of which the revenues of the government rapidly declined; and by Dec. 17 it became necessary to pass a law for the issue of \$10,000,000 one-year treasury notes bearing 6 and 12 per cent. interest, and which were authorized to be paid to the public creditors. By act of March 2, 1861, \$22,468,000 two-year and \$12,896,350 sixty-day notes were provided for; and by acts of July 17 and Aug. 5, 1861, \$139,999,750 three-year 7-30 notes, and \$50,000,000 treasury notes payable on demand, the latter being by act of Feb. 12, 1862, to meet a most pressing emergency, increased by \$10,000,000. The preparations for war from March 4, 1861, and its subsequent prosecution, called for immense expenditures; and by December, 1861, the secretary of the treasury had borrowed from the banks and capitalists of New York, Philadelphia, and Boston \$144,000,000, which he had required them to pay in coin; and in the course of this month these banks found themselves under the necessity of suspending specie payments. The demand treasury notes, not being a legal tender, did not enter freely into circulation, and there were instances of soldiers having to submit to the loss of a discount on those received for pay of from 4 to 20 per cent. in the District of Columbia. These notes were kept at par with the banks and received by them so long as they had to pay the government for loans; but by Feb. 5, 1862, the last of these loans was paid for, and the banks refused to receive the notes. The treasury was by this time nearly empty, and the secretary was unable to negotiate any further loans, while there were the most pressing demands upon him. The floating liabilities then due were \$100,000,000, and not less than \$150,000,000 more would be wanted before July 1 following. The committee of ways and means of the house of representatives had about

this time perfected a bill for the issue of \$150,000,000 in notes, to be a legal tender for the payment of all debts, public and private. The secretary early in February strenuously urged the passage of this act, to the support of which he had however come with great reluctance. He said: "Immediate action is of great importance. The treasury is nearly empty. I have been obliged to draw for the last installment of the November loan; so soon as it is paid, I fear the banks generally will refuse to receive United States notes. You will see the necessity of urging it through without more delay." It passed the house of representatives Feb. 6, 1862, and the senate with important amendments on the 13th; and after being referred to a conference committee, it was passed in an amended form by the house on the 24th and by the senate on the 25th. The same day it received the signature of the president and became a law. These notes were made receivable in payment of "all taxes, internal duties, excises, debts, and demands of any kind due to the United States, except duties on imports, and of all claims and demands against the United States of any kind whatsoever, except for interest upon bonds and notes, which shall be paid in coin; and shall also be lawful money and a legal tender in payment of all debts, public and private, within the United States, except duties on imports and interest aforesaid." They were also receivable "the same as coin at the par value, in payment for any loans that may be hereafter sold or negotiated." By act of July 11, 1862, \$150,000,000 more of these notes were authorized, \$50,000,000 to be held as a reserve for the payment of temporary loans. In all, by these acts and those of Jan. 17 and March 3, 1863, \$450,000,000 were authorized, and \$400,619,206 were actually issued, besides compound interest and 7-30 notes. In addition to these, \$50,000,000 of fractional currency was authorized, of which \$48,151,000 had been issued to Nov. 1, 1874. Subsequent to the close of the war, in addition to other notes, \$44,000,000 of the legal-tender notes were retired, thus reducing their amount to \$356,000,000; while by act of June 22, 1874, the volume of these notes was fixed at \$382,000,000, which amount had been issued on Nov. 1, 1874. By act of congress approved Feb. 28, 1863, the national banking system was established. Under this system, to Nov. 1, 1874, circulation had been issued and was then outstanding to the amount of \$351,927,246. Under act approved July 12, 1870, providing for banks whose issues should be redeemable in gold on demand, \$2,150,000 of notes have been issued. In 1873 the director of the mint estimated, from the most trustworthy data, the gold coin in the country at \$135,000,000, and the subsidiary silver coin at \$5,000,000, total \$140,000,000; thus making the grand total of money of all kinds \$924,228,246. A careful estimate of the circulating medium of the United Kingdom of Great

Britain and Ireland at the close of 1872 placed the gold coin at £105,000,000, the silver coin at £15,000,000, and the bronze coin at £1,148,000; total metallic circulation, £121,148,000. The circulation of the bank of England on Oct. 16, 1872, was £34,828,708. The notes in circulation in the United Kingdom, other than those of the bank of England, in September, 1872, were as follows: England, £5,057,910; Scotland, £5,313,560; Ireland, £7,242,081; making a total paper circulation of £51,942,259, and of metal and paper combined of £173,090,259 = £841,218,658. According to Necker, the circulation of France in 1789 was equivalent to \$450,000,000, all metallic. The assignats issued by the revolutionary government of France during the years 1790-'96 are estimated as high as \$9,000,000,000. The circulation of France at the present time is estimated at 4,000,000,000 francs metallic, while the notes of the bank of France in circulation Oct. 9, 1874, were 2,970,881,660 francs; total, 6,970,881,660 francs = \$1,394,176,332.—*Money of Account.* A full and clear understanding of money can hardly be had without a realization of the true position and office of money of account; a subject seldom even adverted to in any of the treatises upon money. When any coin or weight of gold or silver, or any other article of value or of general acceptability, has for a considerable time been used as an equivalent or in payment for things purchased, the people using it assume the value of the article in question as the unit of a money of account, and employ it to express prices. By incessant use it is impressed upon and becomes familiar to the mind, is "committed to the memories of a whole nation," and "performs the same office with regard to the value of things that degrees, minutes, seconds, &c., do with regard to angles, or as scales do to geographical maps, or to plans of any kind." It becomes in fact "an arbitrary scale of equal parts, invented for measuring the respective values of things vendable." The use of a money of account is in no respect a mechanical process by which other articles are compared by weight or bulk with gold or silver; but it is an arithmetical one, by which they are compared with a unit of value, which has had its origin in some coin or other commodity which possesses the quality of acceptability for the payment of debts and the purchase of commodities. Hence it is that a money of account, having been long in use, and become a part of the modes of thought of a people, often long survives the existence of the coin or other commodity upon which it was based. The money of account of the bank of Venice, undisturbed for 500 years, had no coins to correspond with it, and the value of all coins was expressed in it. A money of account is a language in which all values or prices may be expressed, and by means of which the relative values of commodities may be stated. It is something which each and every one carries in

his mind, as he does his knowledge of words or of arithmetic, and in so doing he is quite independent of any thought of coinage or of circulating notes. These are facts which have in whole or in part been recognized by various writers differing in almost all other respects in regard to money, and they have been controverted by but few. But being facts close at hand, familiar, and almost self-evidently true, their full significance and far-reaching importance have been overlooked and disregarded by almost all economists. Count Garnier and Stephen Colwell have of all writers probably most fully appreciated the importance of a clear understanding of money of account. According to the latter, it is the central point from which the whole science of money must be studied, and without which mode of procedure no true conception of it can be had. The money of account in use by a people is not only the standard by the aid of which the value of commodities may be stated, but is used to express the value of coins or circulating notes, and, if these coins or notes be of the same denomination as the money of account, unerringly indicates whether such coins or notes are at par, at a discount, or at a premium. Had men better understood this subject in Great Britain during the suspension of the bank of England, 1797-1823, there would have been far less discussion than there was as to whether bank of England notes were then at a discount or gold was at a premium. The bullion committee had a glimmering of the truth when they "doubted whether, since the new system of bank of England payments has been fully established, gold has in truth continued to be our measure of value." The money of account had in fact adjusted itself to the standard of payment furnished by the bank, and the committee half suspected that such was the case.—*Theory of Money.* In its theoretic or economic aspects, money presents a field of apparently hopeless discord, controversy, and confusion, without a single doctrine established as a principle of universal or even of general acceptance. In a word, no one of these doctrines can be presented as a truth which needs only to be stated, not demonstrated; no one who writes upon them can properly lay down any so-called principles without at the same time giving the ground upon which each one of them claims to rest. To go no further back, Montesquieu and Hume about the middle of the 18th century laid down the dictum which, stated in the words of Hume, is as follows: "It seems a maxim almost self-evident, that the prices of everything depend on the proportion between commodities and money, and that any considerable alteration on either has the same effect of heightening or lowering the price;" and from that time to the present hour there has been a sharp and never ceasing controversy upon every phase of the subject. A memorable era in this controversy was the period between the suspension

of specie payment by the bank of England, Feb. 27, 1797, and the decade following resumption in 1823, which gave rise to discussions which, in the opinion of Mr. J. R. McCulloch, "all but perfected the theory of money." A particularly striking feature in the literature of the discussions of that time is that which is known as the "Bullion Report," *i. e.*, the report from the select committee appointed to inquire into the cause of the high prices of gold bullion, and to take into consideration the state of the circulating medium and the exchanges between Great Britain and foreign parts. This report was ordered by the house of commons to be printed June 8, 1810. The conclusions of the committee were, "that there is at present an excess in the paper circulation of this country, of which the most unequivocal symptom is the very high price of bullion, and next to that the low [high according to the American mode of expression] state of the continental exchanges; that this is to be ascribed to the want of a sufficient check and control in the issues of paper from the bank of England, and originally to the suspension of cash payments, which removed the natural control. For upon a general view of the subject your committee are of opinion that no safe, certain, and constantly adequate provision against an excess of paper currency, either occasional or permanent, can be found except in the convertibility of such paper into specie." The committee "doubted whether, since the new system of bank of England payments has been fully established, gold has in truth continued to be our measure of value, and whether we have any other standard of prices than that circulating medium issued primarily by the bank of England, and in a secondary manner by the country banks, the variations of which in relative value may be as indefinite as the possible excess of that circulating medium;" and thought that "an increase in the quantity of the local currency of a particular country will raise prices in that country, exactly in the same manner as an increase in the general supply of precious metals raises prices all over the world." Briefly, the report was, and probably is still, the most carefully elaborated and consistent statement of the doctrines of Montesquieu and Hume to be found in the language. It was far, however, from setting the subject at rest. There was then a large school, and there is now perhaps a larger one, which argues against all the conclusions of the committee, as well as against the reasoning by which those conclusions are reached. It has been contended by this latter school that money has a fructifying influence upon industry, and that an increase in its volume may increase production, trade, and commerce, and, so far from necessarily increasing prices, in some cases actually reduce them; that if the theory were true, no increased production in a country, were it two, five, ten, or twenty fold, without a corresponding increase in the vol-

ume of money, could increase the aggregate value of these productions a single dollar. There are those who contend, in opposition to the bullion report, that "money should be a thing of a country, of a people, and not of the world;" and that the financial and business affairs of a country should in no wise be based upon the precious metals, which are, it is contended, liable to export, beyond the control of the people or the authorities of a state. There have long been a considerable number of writers in Great Britain holding these opinions, but it is in this country and within a comparatively recent period that such views have taken most decided and original shape. By no means all of these writers contend for an arbitrary volume of such money, only limited by the wants of the state or of the people at a particular time. Several of their plans have contemplated the conversion of this money by means of funding to any extent which a curtailment in the monetary wants of the people may demand. Probably the earliest advocate of such a system as is here referred to was Edward Kellogg, who in September, 1843, published in New York a pamphlet entitled "Currency, the Evil and the Remedy." He proposed as a remedy for usury, that the United States government should establish a national safety fund, which should lend money on mortgage of real estate at 3 per cent. per annum, in the form of "circulating medium or safety fund notes," which notes were to be payable or fundable at the pleasure of the holder in "treasury notes" or bonds, bearing interest at the rate of 2 per cent. per annum, and payable on and after one year from a given day, in circulating medium or safety fund notes. This idea was elaborated by him in subsequent works; and immediately before and after the passage of the act of Feb. 25, 1862, providing for the issue of United States legal-tender notes, it was strongly urged upon the government by prominent financiers that these notes should be made interconvertible at the pleasure of the holder with United States bonds. This scheme of finance, called the "3-65 bond plan," has attracted much attention. Its friends maintain that the interchangeability of national paper money with government bonds bearing a fixed rate of interest will give an automatic, self-adjusting volume of currency at all times, commensurate with the wants of the people and of business; and that it will preclude the possibility of financial crises by introducing a cash system of business instead of the credit one which at present exists. In entire consistency with the history of all financial schemes and theories, old as well as new, this plan is opposed with a vigor nearly if not quite equal to that with which it is advocated.

MONGE, Gaspard, a French mathematician, born in Beaune in 1746, died July 28, 1818. He became assistant to Bossut, and also to the abbé Nollet at Mézières, whom he succeeded in the chair of natural philosophy. He made nu-

merous experiments in physics and chemistry, and investigations into the principles of geometry, which led to the foundation of a new and important department of that science, to which he gave the name of descriptive geometry. In 1780 he was made a member of the academy of sciences, and soon after assistant professor of hydrodynamics in Paris. During the revolution he was for a short time minister of marine. Through his exertions the normal and polytechnic schools were established, and he taught in both. He accompanied the army into Italy and Egypt, and on his return was made president of the Egyptian commission, head of the polytechnic school, and member of the senate with the title of count of Pelusium; but on the fall of Napoleon he was deprived of all his honors. He was the first who applied the differential calculus to the general theory of surfaces. His best known work is the *Géométrie descriptive* (1799; 4th ed., 1819).

MONGHIR, a town of British India, in Bengal, on the right bank of the Ganges, 80 m. E. S. E. of Patna; pop. about 30,000. The numerous temples give it a fine appearance, and the picturesque and salubrious situation make it a favorite residence for invalids. It contains 16 markets, extending $1\frac{1}{2}$ m. from N. to S. Inferior hardware and firearms are manufactured. The houses are mostly of the poorest description. A rock jutting into the river is a shrine for pilgrims, and adjoining the bathing place was formerly a temple which has been converted into a mosque. The town is of great antiquity, and formerly contained a magnificent palace. The fort, celebrated for its picturesqueness, is built on a prominent rock; it is 4,000 ft. long and 3,500 ft. wide, and contains the official and European residences. It was once an important stronghold, but has declined in importance, and is falling to ruins.

MONGOLIA, a country of Asia, part of the Chinese empire, lying between lat. 37° and 54° N., and about lon. 85° and 125° E., bounded N. by Siberia, N. E. and E. by Manchooria, S. by the Chinese provinces of Chihli, Shansi, Shensi, and Kansu, and W. by East Turkistan and Dzungari; area, about 1,300,000 sq. m.; pop. about 2,500,000, of whom 500,000 are Chinese. It is chiefly a plain, about 3,000 ft. above the sea, almost destitute of wood and water. In the central part the great sandy desert of Gobi stretches N. E. and S. W., occupying about a third of the entire area. The chief mountain ranges are the Altai and its subordinate chains, which extend eastward, under the names of Tangnu-Oola and Kenteh, as far as the Amoor; and the Ala-shan, In-shan, and Khingan ranges, which commence about lat. 38° and lon. 107° , and run N. E. and N. to the Amoor, crossing into Manchooria. The rivers are chiefly in the north. The Selenga, Orkhon, and Tola unite and flow into Lake Baikal. The Kerulen and Onon rise near each other on opposite sides of the Kenteh range, and flow N. E. to the Amoor. In the south, the coun-

try S. of the In-shan range is traversed by the Hoang-ho or Yellow river. In the N. W. part of the country lakes abound, the largest of which are the Upsa-nor, the Kossogol, and the Ike-aral.—Mongolia is divided into four principal regions: 1, Inner Mongolia, between the great wall and the desert of Gobi; 2, Outer Mongolia, between the desert and the Altai mountains, reaching from the Inner Khingan to the Thian-shan; 3, the country W. of the Ala-shan; 4, Uliassutai and its dependencies. Inner Mongolia is divided into 6 corps and 24 tribes, which are subdivided into 49 standards, each comprising about 2,000 families commanded by hereditary princes. The Korchin (about 200,000) and the Ortoos (400,000) are the principal tribes. Another large tribe, the Tzakhars (180,000), occupy the region immediately north of the great wall. Outer Mongolia is divided into four circles, each of which is governed by a khan or prince who claims descent from Genghis Khan. The Khalkas (250,000) are the principal tribe, and their four klanates are divided into 86 standards, each of which is restricted to a particular territory. The country W. of the Ala-shan is occupied by Torgots, Khoshots (120,000), Khalkas, and other tribes, arranged under 29 standards. Uliassutai is a town of 2,000 houses in the W. part of Mongolia, and lies in a well cultivated valley. Its dependent territories comprise 11 tribes of Khalkas divided into 31 standards.—Mongolia is supposed to be rich in metals and minerals. Its immense plains and forests are inhabited by multitudes of wild animals, among which are the elk, the stag, the wild goat, the wild ass, the yak, the brown and black bear, the ounce, and two species of tiger, besides hares, squirrels, and foxes. The wolves of Mongolia are large and fierce; they will pass through a flock of sheep to attack the shepherd. Among the birds are pheasants and eagles. The eagle is very common, and makes its nest where it pleases, the people never molesting it. The double-humped or Bactrian camel exists in both the wild and domesticated state, supplying excellent milk and large quantities of butter and cheese.—The soil of Mongolia is poor, and little of it is fit for cultivation on account of the want of moisture, neither rain nor snow falling in sufficient quantities except on the acclivities of the mountain ranges. From the great elevation of the country and the dryness of the atmosphere, the climate is excessively cold. Mercury in some parts often remains frozen for weeks in succession. The winter lasts nine months, and is immediately succeeded by summer, in which there are sometimes days of stifling heat. The nights are almost invariably cool. At all seasons the weather is subject to great and sudden changes. In the southern part of the country, where Chinese immigrants have introduced agriculture, the temperature has risen with the increase of cultivation, so that kinds of grain which formerly would not

ripen because of the cold are now raised with success. In this part of Mongolia villages are frequent, and a portion of the native race have adopted a settled life. The greater part of the Mongols, however, are gradually retiring toward the north, and the Chinese population is rapidly taking their place.—The Mongols belong to the so-called Turanian, Mongolian, or Uralo-Altaic division of mankind. Their branch, best designated as that of the Mongols proper, is composed of three families, of which the East Mongols are the inhabitants of the present territory of Mongolia; these are subdivided into Shara Mongols, occupying the southern portion, and the Khalka Mongols, living in the north. The West Mongols, comprising Calmucks, Torgots, and others, were driven out of their land at the time of Genghis Khan, and a portion of them now lead a nomadic life in the steppes between the Volga and the Ural, while the others dwell on the slopes of the Altai mountains, and are generally known as Black Calmucks. On the Chinese frontier, in the region of the Lena, and from the Onon as far as the Oka, is found the third family, called Buriats. Some Mongols proper, still speaking a Mongolian dialect, inhabit the northern portion of Iran, where they are known as Aimaks or Hezarehs. Though the name of Tartars is generally applied also to Mongols proper, there can be no doubt that the Tartars form a distinct branch of the Mongolian or Turanian division. (See TURANIAN RACES AND LANGUAGES.) The present inhabitants of Mongolia are generally stout, squat, swarthy, and ugly, with high and broad shoulders, pointed and prominent chins, long teeth distant from each other, eyes black, elliptical, and unsteady, thick, short necks, bony and nervous hands, and short muscular arms. Their stature is equal to that of Europeans. They are, with few exceptions, nomadic, living in tents and subsisting on animal food. The Mongol tent for about 3 ft. from the ground is cylindrical; it then becomes conical. The portion made of wood is a trelliswork of crossed bars which may be folded up or expanded. Above these, a circle of poles fixed in the trelliswork meets at the top, like the ribs of an umbrella. Over the woodwork is stretched a thick covering of coarse felt. The door is low and narrow. At the top of the tent is an opening to let out smoke, which can be closed by a piece of felt hanging above it, to which is attached a long string. The interior is divided into two compartments, that on the left being for the men, while that on the right is occupied by the women and is also used as a kitchen, the utensils of which consist chiefly of large earthen vessels for holding water, wooden pails for milk, and a large bell-shaped iron kettle. A small sofa or couch, a small square press or chest of drawers, and a number of goats' horns fixed in the woodwork, on which hang various utensils, arms, and other articles, complete the furniture. Household and family cares are assigned entire-

ly to the women. The men conduct the flocks and herds to pasture. They sometimes hunt wild animals for food or for their skins, but never for pleasure. When not on horseback, the men pass their time in absolute idleness, sleeping all night and squatting all day in their tents, drinking tea or smoking. The only persons who learn to read are the lamas or priests, who are also the painters, sculptors, architects, and physicians of the nation. The Mongol is so accustomed to horseback that when he sets foot on the ground his step is heavy and awkward, his legs bowed, his chest bent forward. The Mongols marry very young, and their marriages are regulated entirely by their parents. A plurality of wives is permitted, but the first wife is always the mistress of the household. Divorce is very frequent. The husband who wishes to repudiate his wife sends her back to her parents, without any formality except a message that he does not require her any longer. This does not give offence, as the family of the lady retain the cattle, horses, and other property given to them at the time of the marriage, and have an opportunity of selling her to a fresh purchaser. The women come and go at pleasure, ride out on horseback, and visit freely from tent to tent. The chiefs of the Mongol tribes and all their blood relatives form an aristocracy who hold the common people in a mild species of patriarchal servitude. There is no distinction of manners or of mode of living between these classes; and though the common people are not allowed to own land, they frequently accumulate considerable property in herds and flocks. Those who become lamas are entirely free.—The ancient religion of the Mongols was a species of Shamanism, but in the 13th century they embraced Lamaism. Their religious system at the present day is similar to that of Thibet, and they acknowledge the spiritual supremacy of the grand lama at Lassa. (See LAMAISM.) Mongolia abounds in well endowed lamaseries constructed of brick and stone, with elegance and solidity, and ornamented with paintings, sculptures, and carvings. The most famous is that of Urga or the Great Kooren, on the bank of the river Tola, in the country of the Khalkas. Thousands of lamas dwell in this lamastery, and the plain adjoining it is always covered with the tents of pilgrims. In these lamaseries a strict monastic discipline is maintained, but each lama is at liberty to acquire property by any occupation not inconsistent with his priestly character. Nearly all younger sons of the free Mongols are devoted from infancy to the priesthood. Almost every lamastery of the first class has a living Buddha, who like the grand lama of Thibet is worshipped as an incarnation of the deity. The influence of these personages is very great, and the Chinese emperors spare no pains to win over to their interest those who manage these deities.—The trade between China and Russia passes through Mongolia at Kiakhtha, a town on

the borders of the two countries. This trade, which is entirely under the supervision of Manchoo officers, introduces among the Mongols European goods in moderate quantities.—The Mongolian language was reduced to writing about the 14th century. Its literature consists in great part of translations of Chinese books, but it embraces a few original histories and many poems, relating chiefly to Genghis Khan and to Tamerlane. The history of the Mongols properly commences with Genghis Khan. At his birth (about 1160) the Mongols were divided into petty and discordant tribes. He united them into one nation, and led them forth to conquer the world. Under his banners they subjugated the whole of Tartary, and a great part of China, Corea, Afghanistan, Persia, and Russia. Under his sons and successors the conquest of China was continued, the caliphate of Bagdad was overthrown, the sultan of Iconium in Asia Minor made tributary, and Europe overrun and devastated as far as the Oder and the Danube. The Mongol empire was at this time the most extensive that the world has ever seen. Kublai Khan, the grandson of Genghis, established the first Mongol dynasty in China (1279–1368), and conquered also Cochinchina and Tonquin. He is known in Chinese history as the emperor She-tsu, and as the founder of the 24th or Yuen dynasty. In 1368 the native race rose in insurrection and established their independence under the Ming dynasty. The Mongol empire was split into several independent sovereignties in the 13th century, but was reunited by Tamerlane in the 14th. After his death (1405) the Mongol power slowly declined, and in the early part of the 17th century the Mongols gradually submitted to the sovereignty of the Manchoo emperors of China. But they yield little more than a nominal obedience. The Chinese government watches and humors them with incessant anxiety, and conciliates their chiefs by annual presents of considerable value. The Mongol empire in India, however, established by Tamerlane's descendant Baber in 1526, lasted nominally till 1858. (See *MONGOLS*).—See Huc's "Travels in Tartary, Thibet, and China" (2 vols., 1852), and Wolff's *Geschichte der Mongolen* (Breslau, 1872).

MONGOUS. See *ICHNEUMON*, and *LEMUR*.

MONITEAU, a central county of Missouri, bounded N. E. by the Missouri river, and drained by Saline, Moreau, and Moniteau creeks; area, 400 sq. m.; pop. in 1870, 11,375, of whom 879 were colored. Iron, limestone, and excellent coal are found, and the soil is generally fertile. The county is traversed by the Pacific railroad of Missouri. The chief productions in 1870 were 204,589 bushels of wheat, 502,917 of Indian corn, 204,036 of oats, 32,274 of potatoes, 53,706 lbs. of tobacco, 42,688 of wool, 178,283 of butter, and 6,023 tons of hay. There were 5,004 horses, 1,314 mules and asses, 10,727 cattle, 17,187 sheep, and 23,271 swine. Capital, California.

MONITOR, the common name of many of the old-world slender-tongued lizards of the family *varanidae* and genus *varanus* (Merr.). They have an elongated head; long, extensible, bifid, fleshy tongue, enclosed in a sheath at the base; no teeth on the palate, those of the jaws flattened at the roots, lodged in a common groove or alveolus without internal border, with the crowns generally pointed and curved backward; the neck long; the head and body covered with tuberculated non-imbricated scales; the tail very long, sometimes containing 80 vertebrae, capable of reproduction, non-prehensile, compressed and keeled or rounded according as the species are aquatic or terrestrial; no femoral pores nor dorsal crest; eyes with two distinct movable lids; feet large, with five unequal, non-palmated toes, furnished with strong claws; in the fore limbs the first finger is the shortest, and the third and fourth longest; in the posterior the fourth is three times as long as the first. The monitors form a natural transition to the serpents, in the suspension of the bones of the face to the cranium and their mobility, in the incomplete circle of the orbits, in the long and narrow lower jaw loosely united in the middle, in the tongue, and in the scaly covering. The colors vary from black to deep green, with lighter spots arranged in various ways so as to resemble mosaic work; many of these patterns are so admirable that the skin has been used to cover jewel boxes. These reptiles are, next to the crocodiles, the largest of living saurians; they live either in the neighborhood of rivers, or in dry sandy regions, the former class being said to give notice of the presence of crocodiles by a whistling sound, whence their common name;



Nilotic Monitor (*Varanus Niloticus*).

they run rapidly on the ground, in a serpent-like manner on account of the length of the tail. Their food consists principally of the larger coleopterous and orthopterous insects; they also eat the eggs of aquatic birds and

reptiles, and lizards, small tortoises, fish, and mammals. The true monitors, of which fewer than 20 species are described, are confined to Asia, Africa, and Australasia. Of the genus *varanus*, erroneously called *tupinambis* by Daudin, the best known aquatic species is the monitor of the Nile (*V. Niloticus*, Fitz.), common in the rivers of Egypt and of western and southern Africa, and attaining a length of 5 or 6 ft., of which the head is about one eleventh, the neck one ninth, and the tail nearly one half; the teeth are 30 above and 22 below; the general color above is greenish gray with black dots, with four or five yellow V-shaped marks pointing backward upon the nape, bands of yellow eye-like spots on the back, a wide black band on the shoulder, and a narrow one edged with pale green on each temple; whitish below, with brown transverse bands, and the claws black. From its supposed usefulness in devouring the eggs of the crocodile, it was highly esteemed by the ancient Egyptians. Other aquatic species are found in the East Indies, and in Australia and its archipelago. Of the terrestrial monitors the best known is the *V. scincus* (Merr.), the skink of the ancients, the land crocodile of Herodotus, the *waran* of the Arabs, and the genus *psammosaurus* of Fitzinger. This is very common in the sandy deserts of Egypt; it is about 3 ft. long, of which the rounded tail is more than half. The color of the upper parts varies from brown to yellow, spotted and banded with one or the other; it is less carnivorous and ferocious than the aquatic monitors.—Cuvier, in his *Ossements fossiles*, has referred to the family of monitors several gigantic fossil reptiles, as the *protorosauros* (H. de Meyer), from the coppery schists of Germany; the *mosasaurus* (Conyb.), over 30 ft. long, intermediate between monitors and iguanas, from the calcareous strata of Maestricht; the *geosaurus* (Cuv.), 12 or 13 ft. long, from an iron mine near Mannheim; and the *megalosaurus* (Buckland), about 40 ft. long, from the vicinity of Oxford, placed by Pictet among the dinosaurs, having certain mammalian characters.—The name of monitor is sometimes given to some American lacertian lizards, especially of the genus *salvator* (Dum. and Bibr.), more properly called safeguards, corresponding in part to *tupinambis* (Daud.) and *tejus* (Merr.), and to *monitor* (Fitz.).

MONITOR, in naval architecture. See IRON-CLAD SHIPS.

MONK. See MONACHISM.

MONK, George, duke of Albemarle, an English general, born at Potheridge, Devonshire, Dec. 6, 1608, died in London, Jan. 3, 1670. At the age of 17 he was a volunteer in an unsuccessful expedition against Cadiz under his relative, Sir Richard Greenville. About a year later he enlisted in the force sent to the isle of Ré, and remained in the service till 1628. Soon after the peace of that year he entered the service of the United Provinces, and returned to England about 1638 with the rank

of captain. He soon received an appointment in the army of Charles I., under whom he served with the rank of lieutenant colonel in the two expeditions undertaken just before the conference of Ripon (1640). In 1642 he was appointed colonel of the forces sent to suppress the Irish rebellion, and remained in this service till the breaking out of the civil war. In 1643 he was recalled, but was arrested immediately on his landing in England, and deprived of his office, on suspicion of his favoring the parliament (September). This was so satisfactorily disproved that he was speedily restored to command and promoted to be major general of the Irish brigade, then (January, 1644) engaged in the attack on Nantwich. He had scarcely arrived at that place when he was surprised, defeated, and captured by Sir Thomas Fairfax; and he was imprisoned in the tower for about two years. On his release both parties eagerly endeavored to secure his services; and in November, 1646, he was finally induced by arguments and bribes to take the "solemn league and covenant" and espouse the parliamentary side. He was at once sent to Ireland, and commanded there against O'Neill from 1647 to 1649, exhibiting such military talent as to gain the high opinion of Cromwell, who in 1650 made him lieutenant general of ordnance in the expedition against the Scotch. Here he greatly distinguished himself, especially at the battle of Dunbar. He was now appointed commander-in-chief in Scotland, completed the conquest of the country, and having fully subjugated it, and compelled the formal union of Scotland with the commonwealth, he returned to England in 1652, leaving a reputation for great power and energy, but also for occasional cruelty; the most noteworthy example of the latter quality being his butchery in cold blood of the governor and 800 of the garrison of Dundee (1651). In the war against the Dutch, Monk was sent into the channel with a fleet which he commanded jointly with Gen. Dean till the death of the latter on June 2, 1652, in an action in which the final success of the English was due to Monk's persistency in maintaining the fight till the arrival of reinforcements under Blake. He was commander of the fleet in the action on July 31 (new style, Aug. 10), 1653, in which Van Tromp was killed and the Dutch defeated. In 1654 he suppressed the royalist insurrection in Scotland, and afterward kept that kingdom under the full control of the commonwealth until the death of Cromwell. From that time he devoted himself to the acquisition of personal power, striving to conciliate both the royalists and their opponents. When Richard Cromwell resigned the protectorate, in 1659, Monk declared for the parliament, and marched to London with 7,000 men; yet he acted with such skilful duplicity that while he now had the whole country practically under the control of himself and his troops, it was impossible to foresee in what way he would use the power he had acquired.

This course he continued after his arrival in London, and his first decisive act, compelling the parliament to readmit the expelled members, was only performed after a long study of the tendency of public opinion. From this time, however, his actions were rapid and decisive. He brought the army, with which he was always exceedingly popular, into a very perfect state of organization; and the restored members of parliament having brought about his appointment as commander-in-chief, he began to fill the principal offices in the army with royalists. This accomplished, he dissolved the old parliament and assembled a new one, to which, on May 1, 1660, he introduced Sir John Greenville, ambassador from the banished Charles II., with proposals for a restoration of the king. Everything having been prepared for this step by Monk, the proposals were at once accepted, and Charles landed at Dover. Every favor was now conferred upon Monk, and besides the titles of duke of Albemarle and earl of Torrington, with several minor dignities, he received large grants of money and lucrative offices. He resided in London, and continued active in public affairs. In 1664 he presided at the admiralty. In 1665 he displayed great bravery and ability as governor of London during the plague. In 1666 he again commanded (with Prince Rupert) a naval force against the Dutch, and served with much distinction; but he returned from the expedition ill of dropsy, of which he died. He was buried in Westminster abbey.—See “Life of Monk,” by Skinner (London, 1751), and by Guizot (Paris, 1851; English translation by Wharnccliffe).

MONK, James Henry, an English author, born in Huntingford, Herts, early in 1784, died at Stapleton, near Bristol, June 6, 1856. He studied at the Charterhouse, and at Trinity college, Cambridge, where in 1807 he became assistant tutor, and in 1808 professor of Greek, but resigned that office on becoming dean of Peterborough in 1822. In 1830 he became bishop of Gloucester. His principal work is the “Life of Bentley” (2 vols. 4to, 1831; revised ed., 1833).

MONKEY, the common name of the family *simiæ* of the order *quadrumana*. The teeth are 32 to 36, and more or less approximate; the canines are larger than the incisors, the upper ones separated by a considerable interval from the latter; the face denuded; the fore feet often larger than the hind, and the middle finger of both hands and feet the longest; opposable thumbs on fore and hind limbs, chiefly formed for grasping; mammae pectoral, two or four; stomach simple. Their food consists of vegetables and insects. Their habits are generally arboreal, and their habitat the forests of tropical America, Asia, and Africa. The monkeys of the new world are entirely distinct from those of the old; the former have been called *simiæ platyrrhini*, or broad-nosed monkeys, and the latter *simiæ catarrhini*, or narrow-

nosed monkeys.—The *platyrrhini* have the nostrils wide apart, on the sides of the nose as it were; they have no cheek pouches nor callosities on the rump, and their long tails are generally prehensile; the hands have either four or five fingers, the first or thumbs very slightly if at all opposable; the teeth are: incisors $\frac{1}{4}$, canines $\frac{1}{2}$ – $\frac{3}{4}$, molars $\frac{3}{4}$ – $\frac{1}{2}$ =36; they inhabit the warm parts of South America. The marmosets have been described under that title, and the remainder of the tribe may be divided into howlers and sapajous. The howling monkeys belong to the genus *mycetes* (Illiger), and are characterized by a pyramidal head, bearded face, pentadactylous hands and feet, and tail naked at the end on the lower surface; the lower jaw is very high, and the hyoid bone is expanded into a kind of drum, which renders the voice so resonant and loud that their troops make a most frightful noise during the night; they are the largest and fiercest of the American monkeys, resembling the baboons in disposition



Araguato (*Mycetes ursinus*).

and facial angle, and the gibbons (*hylobates*) in their noisy and gregarious habits. The species are most abundant in Guiana and Brazil, where 30 or 40 are often seen on a single tree. The brown howler or araguato (*M. ursinus*, Humb.) is reddish brown, with long hair and beard, and bluish black face; it is nearly 3 ft. long, exclusive of the tail. There are several other species. The sapajous are more slender, with flatter faces, longer tails, and milder dispositions than the howlers, resembling the guenons or long-tailed monkeys of the old world. In the genus *ateles* (Geoffroy), the head is rounded, the limbs very long and slender, the fore hands without thumbs, or with very rudimentary ones, and the tail long and prehensile and bare at the tip beneath. The coaita (*A. paniscus*, Geoffr.) is entirely black; it is a timid, mild animal, rather sluggish when not excited, but exceedingly agile among the trees; as it swings from the branches by the tail it looks not un-

like a large black spider, and it is commonly called spider monkey; the tail is not only a fifth hand for purposes of progression, but an exquisite organ of touch. There are several



Coaita (*Ateles paniscus*).

species, which live in troops on the banks of the Amazon and Orinoco. *Lagothrix* (Geoffr.) differs from the last chiefly in the hands having a thumb and in the greater fineness of the hair; the *L. Humboldtii* (Geoffr.) is grayish black, about 2 ft. long, with the prehensile tail longer than the body. In the genus *cebus* (Geoffr.) the head is rounded, and the long tail is hairy throughout and prehensile; the monkeys of this genus are very active, excellent climbers, with well formed hands; they are small, mild and playful, and gregarious. The horned sapajou (*C. fatuellus*, Geoffr.) is blackish brown, with the face surrounded with whitish and the hair



Capuchin Monkey (*Cebus capucinus*).

of the forehead rising in two lengthened tufts above the eyes. The capuchin monkey (*C. capucinus*, Erxl.) varies from grayish white to olive, with a black crown like a monk's cap.

There are several other species, all lively and mild, inhabiting Guiana. In the genera hitherto mentioned, the nails are flattened and rounded; in the next three they more resemble claws, and the animals included in them have more carnivorous propensities, eating meat, insects, and small birds which they seize. In *callithrix* or tee-tees (Geoffr.), of which the type is the siamiri or squirrel monkey (*C. sciureus*, Geoffr.), the ears are proportionately large, the body slender, the tail longer than the body, entirely hairy, and not prehensile; the color is grayish brown, lighter beneath, with reddish limbs and black muzzle; the body is 7 or 8 in. long, and the tail 10 or 12. Other species are described, all active and beautiful, with carnivorous propensities; they inhabit principally Brazil and Guiana. In *aotes* (Humb.; *nyctipithecus*, Spix) the two middle upper incisors are broad, and the canines moderate; the eyes large; hind feet longest; tail longer than the body, not prehensile; nocturnal in its habits,



Cacajao (*Pithecia melanocephala*).

living in pairs, resembling the lemurs of South Africa. (See DOUGROUCCOLI.) The last genus of the American monkeys which need be mentioned is *pithecia* (Desm.), characterized by a round head, short muzzle, long canines, tail generally shorter than the body, entirely hairy, and not prehensile; they are nocturnal and gregarious, greatly resembling human pigmies, and said to be active, strong, and almost untamable. The couxio or black saki (*P. satanas*, Humb.) is dusky black, with a purplish tinge beneath, and with the tail is about 2½ ft. long. The monk saki (*P. chiropotes*, Humb.) is brownish red, and of all the American species bears the closest resemblance in its features to man; the expression of the face is fierce and melancholy, the chin is covered with a thick beard, and the eyes are large and sunken; it is said to drink from the hollow of the hand, and to be very careful not to wet its beard. The cacajao or black-headed saki (*P. melanocephala*, Desm.)

is about a foot long; the color of the body is yellowish brown, with the head black; there is no beard, and the tail is so short that Spix has placed it in a new genus *brachyurus*; it is weak, inactive, and very timid. The yarke (*P. leucocephala*, Audebert) is black with the head whitish; the hair is very long. These and several other species inhabit the woods of Guiana in troops, where they are generally called night or fox-tailed apes.—Of the old-world monkeys, or *catarrhini*, the largest have been mentioned in the articles APE, BABOON, CHIMPANZEE, GIBBON, GORILLA, and MACAQUE; so that it only remains to notice the smaller and long-tailed species. This division of the monkeys has the same number of teeth as man, viz., 32, and similarly arranged, except that the incisors are more prominent, and the canines larger and separated from the incisors; there is a thin septum between the nostrils, hard naked skin or callosities on the rump, pouches on the sides of the face between the cheeks and the jaws; they generally have tails, though these are absent in the larger anthropoid apes; they are found in the warmer parts of Asia and Africa, only one species being naturalized in Europe (the Barbary ape on the rock of Gibraltar). The first of the monkeys not already noticed, connecting the guenons or long-tailed monkeys with the gibbons or long-armed apes, is the *presbytis* or capped monkey; this has no cheek pouches, but has naked callosities, a long tail, and arms reaching to the knees. The *P. mitrula* (Eschs.) has the body 1½ ft. long, and the tail about as long; the hair is bluish gray above and grayish white below, with a black line from the ears across the head; it is a native of Sumatra. In the African genus *colobus* (Ill.) there are no thumbs on the hands, and the limbs are long and slender as in the spider monkeys (*ateles*) of the new world. The king monkey (*C. polycomus*, Geoffr.) is remarkable for the long, coarse, and flowing hair on the head, like a full-



Proboscis Monkey (*Nasalis larvatus*).

bottomed periwig; the body is shining black, and the tail is pure white. The proboscis monkey (*nasalis larvatus*, Geoffr.) has a short muzzle, but the nose is lengthened into a kind of

proboscis 4 in. long, at the end of which are the nostrils; the body is thick and the limbs stout; there are cheek pouches and callosities, and the tail is longer than the body; the color is reddish brown, with lighter patches on the lower back, and the face black; the body is about 2½ ft. long; they are very active and noisy, and inhabit in large troops the forests of Borneo. The Cochinchina monkey (*lasiopyga nemæa*, Ill.) is a very singularly marked species; the muzzle is slightly elongated, the face bare, the hands longer than the forearm, with short and slender thumbs; it has cheek pouches, but no callosities, and the tail is long. The colors are brilliant, the upper part of the head being brown with a chestnut frontal band, long hair of cheeks dirty white, forearms and tail white, the hands and thighs black, legs chestnut, and body olive gray; it stands nearly 4 ft. high. The first genus of the guenons is *semnopithecus*



Entellus (*Semnopithecus entellus*).

(F. Cuv.), with round head, flat nose, long limbs, short thumbs, small cheek pouches and callosities, slender form, very long and thin tail, and canines much longer than the incisors; they inhabit India and its archipelago. The *S. entellus* (F. Cuv.) has a body about 1½ ft. long and a tail 2 ft.; the hind limbs are much longer than the anterior; the color is yellowish white, paler beneath, with the face, forearms and hands, legs and feet, black; it appears slow, sad, and stupid when at rest, but when roused is extremely active; it is very sensitive to cold, and is therefore rarely seen in menageries. It is called *hoonuman* by the Hindoos, who consider it a crime to kill one, and believe that the person who destroys one will surely die within the year; it occupies a conspicuous place among their divinities. There are several other species in Sumatra. The genus *cercopithecus* (Erxl.) differs from the last in the larger facial angle, more elegant shape and coloring, longer posterior limbs, and milder and more affectionate disposition; it has only four tubercles to the last lower molar, instead of five, as in *semnopithecus*. The varied monkey (*C. mona*, Geoffr.) is the handsomest of all; the body is

chestnut, upper part of head bright yellowish green, cheeks yellow, outside of limbs and tail blackish, with a spot of white on the nates; it is a native of Africa, cunning, active, intelligent, and playful. The Diana monkey (*C. Dianæ*, Geoffr.) is so called from the white



Diana Monkey (*Cercopithecus Dianæ*).

crenate on the forehead; the chin and throat are white; it is about 1½ ft. long with a tail of 2 ft. There are many other species, most, like the first two, from Africa. The mangabeys (*cercocæbus*, Geoffr.) begin to come near the baboons in the more lengthened muzzle and receding forehead, though they have the long tail of the guenons; they are found in Africa and India. The green monkey (*C. sabæus*, Geoffr.) is a native of Africa and the Cape Verd islands, and is very often seen in captivity on account of its lively and playful manners; the color is olive green above, shading into white below, and the face is black. The malbrouck of Bengal (*C. cynosurus*, Geoffr.) is olive brown above, shading into white, with a white band over the eyes; it is an excellent climber and very active, and is often seen in menageries. The white-eyelid mangabey (*C. fuliginosus*, Geoffr.) is sooty black with white and very conspicuous upper eyelids; it is a native of Africa. These and numerous other species of Asia and Africa are generally easily domesticated when young; they are good-natured, playful, and free from the disgusting habits of the larger baboons.—The restriction of the *catarrhini* to the old and of the *platyrrhini* to the new world prevailed in the tertiary geological epochs. Fragments of a jaw and some teeth found in the eocene sand of Suffolk, England, were referred by Owen to the genus *macacus* under the name of *M. eocenus*; this furnishes a proof of the former more elevated temperature of Europe, monkeys having lived during the eocene period 15° further N. than now. In the miocene of France, in lat. 43° N., were found portions of a jaw and teeth, very anthropoid in appearance, belonging to what De Blainville has called *pithecus antiquus*, which

some have thought nearer to man than is the chimpanzee. Other fragments have been found in England, Greece, and France, which have been referred to the genera *macacus*, *pithecus*, and *semnopithecus*. In the Sivalik hills of India have been discovered specimens of *semnopithecus* nearly as large as the oranges, and some resembling baboons. In South America, Lund found in Brazil, in lat. 18° S., specimens which he referred to the genera *cebus*, *callithrix primæus* (twice the size of any living species), and *protopithecus Brasiliensis*, which must have attained a height of 4 ft.; he also found there *ouistitis* (*jacchus grandis*) twice as large as any now living.

MONKSHOOD. See ACONITE.

MONMOUTH, a central county of New Jersey, bordering on the Atlantic ocean, drained by the Nevisink, Shrewsbury, Shark, and Toms rivers; area, about 800 sq. m.; pop. in 1870, 46,195. Its surface is generally level, with elevations toward the northeast. It is traversed by the Freehold and Jamesburg, the New Jersey Southern and Port Monmouth branch, the Toms River and Waretown, and the Tuckerton railroads. The chief productions in 1870 were 176,473 bushels of wheat, 46,567 of rye, 760,479 of Indian corn, 180,461 of oats, 1,263,403 of Irish and 50,892 of sweet potatoes, 41,582 lbs. of wool, 415,367 of butter, and 32,389 tons of hay. There were 6,035 horses, 1,254 mules and asses, 8,033 milch cows, 4,244 other cattle, 14,099 sheep, and 10,890 swine; 13 manufactories of brick, 23 of carriages and wagons, 10 of men's clothing, 5 of furniture, 3 of gold leaf and foil, 5 of tanned and 5 of curried leather, 7 of canned vegetables, 4 distilleries, 28 flour mills, and 8 saw mills. Capital, Freehold.

MONMOUTH, a city and the capital of Warren co., Illinois, situated at the intersection of the Chicago, Burlington, and Quincy, and the Rockford, Rock Island, and St. Louis railroads, 90 m. N. W. of Springfield; pop. in 1870, 4,662. It is the seat of Monmouth college, established in 1856, and of the theological seminary of the Northwest, established in 1839, both under the control of the United Presbyterians. The former institution admits both sexes, and in 1873-'4 had 9 instructors, 138 preparatory and 87 collegiate students, and a library of 1,850 volumes. The seminary in the same year had 3 professors, 12 students, and a library of 2,442 volumes. The city has five hotels, three public halls, two grain elevators, two flouring mills, a planing mill, three manufactories of ploughs, one of files, one of school and church furniture, three national banks, an academy, graded public schools, a library, three weekly newspapers, two monthly periodicals, and nine churches.

MONMOUTH, a market town and borough of England, capital of Monmouthshire, in a valley at the confluence of the Wye and Monnow, 110 m. W. N. W. of London; pop. in 1871, 5,874. Its castle, once the residence of John of Gaunt, is now a mere ruin. There are large iron

works, and the Wye fisheries in the vicinity are flourishing. The trade consists chiefly in the export of bark and timber. The battle of Monmouth, in which Owen Glendower was defeated, was fought May 11, 1405.

MONMOUTH, Battle of, an engagement between the American forces under Washington and the British under Sir Henry Clinton, at Freehold, Monmouth co., N. J., June 28, 1778. On June 18 Clinton evacuated Philadelphia and marched toward Brunswick, with a view of embarking on the Raritan. Washington broke camp at Valley Forge, sent forward some light troops to harass the enemy, and started in pursuit. At Allentown Clinton suddenly turned to the right by a road leading through Freehold to Sandy Hook, and Washington determined at once to give him battle. The evening of the 27th found the main body of the enemy encamped on high ground near Monmouth court house in the town of Freehold, while the American advance, about 4,000 strong, under Lee, was posted at Englishtown, 5 m. distant, with the main body about 3 m. in the rear. Early on the 28th Lee engaged the rear division of the enemy, his orders being to hold it in check until the main body under Washington could come up. The Americans were successful at first, but the whole body soon fell into a confusion in which their commander seemed to participate, and commenced a disorderly retreat, closely followed by the British. Washington, advancing with the main body, received the first intimation of this movement in the crowds of fugitives. He rode up to Lee and reprimanded him vehemently; then, rallying the fugitives, he reformed them, and hastened back to bring up the main body. Lee, resuming his command, held his position with spirit until compelled to retire, and brought off his troops in good order. The main body, which had taken a favorable position on an eminence, with a morass in front and a wood in the rear, opened an effective cannonade from both wings upon the British. The latter, after an ineffectual attempt to turn the American left under Lord Stirling, directed their chief efforts against the right commanded by Greene, where Wayne, under cover of an orchard, was harassing their centre by a severe fire. To dislodge him, Col. Monckton advanced with a column of royal grenadiers, but fell at the head of his troops, who were repulsed with considerable loss. The enemy at length fell back to the ground occupied by Lee in the morning, and during the night Clinton effected a noiseless retreat. Excessive heat and fatigue rendered pursuit impracticable. The American loss was 69 killed and 160 wounded; that of the British probably nearly 300 killed and 100 prisoners, including wounded. On both sides many men died from the heat alone. For his conduct in this battle Lee was court-martialled and suspended for one year from his command.

MONMOUTH, Geoffrey of. See GEOFFREY.

MONMOUTH, James Scott, duke of, supposed son of Charles II., king of Great Britain, born in Rotterdam, April 9, 1649, executed in London, July 15, 1685. His mother was Lucy Walters, who was at first mistress of Algernon Sidney, and afterward of his brother Robert; and the latter was by some reputed the father of Monmouth. While Charles was in Holland, Lucy Walters became his mistress. He acknowledged her son to be his offspring, and was throughout life strongly attached to him. The boy was known as James Crofts, because he was for some time in the charge of Lord Crofts, and passed for his relative. When he was taken to England, in 1662, he was very accomplished and very handsome. He was first made duke of Orkney, but the title was changed to that of Monmouth. He was also created baron of Tyndale and earl of Doncaster at the same time, Feb. 19, 1663. He served on board the fleet of the duke of York in 1665, and was in the battle of Lowestoft, June 3. He married while very young Anne, daughter and sole heir of Francis Scott, earl of Buccleuch, and assumed her name. They were created duke and duchess of Buccleuch, earl and countess of Dalkeith, and baron and baroness of Whitchester and Ashdale in Scotland, in 1673. In 1670 he became captain general of all the king's fortresses, and a privy councillor, and was allowed privileges at court which could be claimed only by persons of the blood royal. At first Monmouth and his uncle, the duke of York, were friends, but they soon became rivals in love and politics. Those who dreaded the accession of York to the throne (the king having no legitimate children, nor expecting any) endeavored to have Monmouth recognized as heir presumptive. When England joined France in the war against Holland, Monmouth was sent at the head of 6,000 troops to act under Louis XIV. in 1672. He served in two campaigns with considerable distinction, and was made a lieutenant general by the French king. Subsequently, as lord general of the king's forces in Flanders, he took part in the battle of St. Denis. He had been made commander-in-chief of the armies of England and Scotland, and was known as "the Protestant duke." He encouraged the Rye House plot, and his designs on the succession to the throne were much favored by Shaftesbury and his associates, and by the extreme unpopularity of the duke of York, who was a Catholic, and who was compelled to leave the country. Monmouth defeated the Scotch Covenanters, June 22, 1679, at Bothwell. As he treated the rebels mildly, and would willingly have spared them all, he was accused of favoring rebellion, and was compelled to resign his office of lord general and to go to Holland. Thence he returned to England without leave, and on his refusal to quit the kingdom his offices were taken from him. He now headed the opposition to the court, and his pretensions to the crown were vigorously pressed by his followers, rather on

a popular than on a legal basis; but when the duke of York returned to court, the story of the marriage of Charles II. and Lucy Walters was gravely urged, and the king deemed it necessary to deny it in the most public and formal manner. The part Monmouth had in the conspiracies of 1683 led to his flight to Holland, after considerable negotiation with the king for pardon. When Charles II. died, Feb. 6, 1685, he left the Hague, and, deluded by the suggestions of British exiles, headed a small expedition, which arrived at Lyme Regis, June 11. At first the duke met with some success; but his forces were beaten at Sedgemoor, July 6, and on the 8th he was captured and taken to London, where he had an interview with James II., of whom he vainly begged his life in abject terms. He was executed under an act of attainder two days after his arrival in the capital. His followers continued for many years to believe that he was alive, and it was supposed by some that he was the man with the iron mask who was so long a prisoner in the Bastille. His wife, a woman of superior talents, from whom he had been separated, survived him nearly 47 years, and married Charles, third Lord Cornwallis. She is the duchess of Scott's "Lay of the Last Minstrel," and Monmouth is the Absalom of Dryden's "Absalom and Achitophel."

MONMOUTHSHIRE, a maritime county of England, bounded S. by the Bristol channel and the estuary of the Severn; area, 575 sq. m.; pop. in 1871, 195,391. The coast, 22 m. in extent, is exposed to the high spring tides that rush up the Severn from the Bristol channel and sometimes attain an altitude of 60 ft. Vast sea walls and earthworks have been erected. The surface toward the north is mountainous and rocky; adjoining the Severn and the sea is a spacious plain, which the river Usk divides into two parts, called the Wentloog and Caldecot levels. The principal mountains are: Pen-y-Val, or the Sugar Loaf, 1,856 ft. high; Blawrence mountain, 1,720 ft.; and Skyrred Vawr, or Holy mountain, 1,498 ft. The chief rivers are the Wye, Usk, and Monnow, the two former of which are famous for their salmon. The soil of the vales and plains is generally fertile. Iron, coal, lead, and building stone are produced. The iron and coal of this county are shipped at Newport. The area of its mineral districts is estimated at 89,000 acres. Chief towns, Monmouth, the capital, Newport, Abergavenny, and Chepstow. Monmouthshire was originally a part of South Wales, and the Welsh language is still largely in use there.

MONNARD, Charles, a Swiss author, born in Bern in 1790, died in Bonn, Germany, Jan. 12, 1865. He was educated in Lausanne and Paris, and in 1817 became professor of French literature in Lausanne. He studied ecclesiastical and civil law, and in May, 1824, a law having been passed to prevent the propagation of Methodism in the canton of Vaud, he declared it unconstitutional, and encouraged his

friend Vinet to stand up for liberty of conscience, publishing for him the treatises *De la liberté des cultes* (1826) and *Observations sur les sectaires* (1829). The former treatise created considerable disturbance. A German translation appeared in 1843. The second treatise caused the suspension of Monnard from his professorship, and his removal to Geneva, whence however he soon returned, became a representative, and was noted for his defence of Swiss independence when in 1838 Louis Philippe demanded the expulsion of Prince Louis Napoleon. After the revolution of 1846 he retired from politics, and accepted the professorship of French literature which was founded for him by the king of Prussia at the university of Bonn.

MONNIER, Henri Bonaventure, a French author, born in Paris, June 6, 1799. He was a clerk in the ministry of justice when he began to study painting under Girodet. He acquired celebrity as a writer of illustrated works, with exquisite caricatures, and especially by his *Scènes populaires* (1830), *Nouvelles scènes populaires* (5 vols., 1835-62), and *Mémoires de Joseph Prudhomme* (new ed., 2 vols., 1857). He wrote and personated the principal part in *Grandeur et décadence de M. Joseph Prudhomme* (1852); and in his equally entertaining vaudeville *Roman chez la portière* (1855) he personated the *portière*.

MONNIER, Marc, a French author, born in Florence about 1829. He spent the early part of his life in Italy, and many of his writings relate to that country. He has published poetry, plays, and novels, and during the past few years has been a prominent member of the staff of the *Journal des Débats*. Among his numerous works are: *Étude historique de la conquête de la Sicile par les Sarrasins* (Geneva, 1847); *Garibaldi, histoire de la conquête des Deux-Siciles* (Paris, 1861); *Pompéi et les Pompéiens* (1864); *Les aïeux de Figaro* (1868), which contains interesting disquisitions on dramatic art; and *Poésies* (1871).

MONO, an E. county of California, bordering on Nevada, and bounded W. by the Sierra Nevada mountains; area, 4,176 sq. m.; pop. in 1870, 430, of whom 42 were Chinese. It is watered in the south by Owen's river, and in the north by the forks of Walker's river. Mono lake, a considerable body of water near the centre, receives several streams, but has no outlet. The slope of the Sierra Nevada is heavily timbered; the rest of the county consists of hills and mountain spurs, with small valleys of tillable land and larger tracts suitable for grazing. Gold and silver are found, two mines of the former and three of the latter being in operation in 1870. The chief productions were 6,144 bushels of wheat, 4,173 of oats, 12,704 of barley, 4,982 of potatoes, 7,000 lbs. of wool, 35,685 of butter, and 2,714 tons of hay. There were 723 horses, 3,227 cattle, and 559 swine; 1 flour mill, 3 saw mills, and 3 quartz mills. Capital, Bridgeport.

MONOD. I. Jean, a French clergyman, born in Geneva in 1765, died in Paris, April 23, 1836. He officiated as pastor of the Reformed church in Paris until the outbreak of the first revolution, when he removed to Copenhagen, where he entertained the duke of Orleans, the future king Louis Philippe. In 1808 he returned to Paris, and in 1830 became president of the consistory. II. **Frédéric Joël Jean Gérard**, eldest son of the preceding, born near Morges, Switzerland, May 17, 1794, died in Paris in 1863. He received his theological education at Geneva, and after the death of his father became pastor of the Oratoire in Paris. His ability as a preacher and his high character made him a leader among the evangelical Protestants of France. After officiating in the Oratoire for more than 12 years, he seceded from the national Protestant church, April 22, 1849, because it did not insist upon "the acknowledgment of Christ as a divine Saviour" as a condition of membership. He organized the Free church of France, resembling in some respects the Free church movement in Scotland. In 1858 he visited the United States, to enlist the sympathies of Americans in the movement. For several years he edited the *Archives du Christianisme*, and he published several sermons and lectures.—His son JEAN, born in Paris in 1822, was pastor at Marseilles and at Nîmes, and was chosen professor of theology at Montauban in 1865. III. **Adolphe Frédéric Théodore**, brother of the preceding, born in Copenhagen, Jan. 21, 1802, died in Paris, April 6, 1856. He was educated at Geneva, and held to the same views in regard to the divinity of the Saviour as his brother Frédéric, yet remained in the national church. He became one of the pastors of the Reformed church in Lyons, whence he was dismissed in consequence of his rigid adherence to evangelical principles. He was afterward professor in the theological school at Montauban, and in 1849, on the secession of his brother, he was invited to fill his place at the Oratoire. He held this post until his death, and gained a high reputation for pulpit eloquence. He is the author of *Lucile, ou la lecture de la Bible* (1841); *Saint Paul* (1850); *La Femme* (1862); and several volumes of discourses. Most of his works have been translated into English.

MONOGRAM (Gr. *μονος*, single, and *γράμμα*, letter), a character or cipher formed by the combination of two or more letters of the alphabet. Monograms were common in antiquity, and their use was almost universal at the beginning of the Christian era. Many are found on Greek and Roman coins, medals, and seals, the names of cities and states being represented monogrammatically where it was an object to save space, and on the leaden *bullæ* of Greece and Sicily. The Chrismon or monogram of Christ, with which coins, seals, rings, lamps, vases, tombs, paintings, and ecclesiastical documents were ornamented in the middle ages, is a combination of the Greek letters

X and P, and represents the first two letters of ΧΡΙΣΤΟΣ. The X is sometimes made to form a cross, and sometimes entirely detached from the P and used in connection with other letters,



Monogram of Christ.

particularly A and Ω. The illustrations are all from tombs in the Roman catacombs, the first two of the 2d century. The Chrismon was the symbol borne on the labarum of Constantine, and it was impressed on the coins of nearly all the succeeding emperors of the East. It is now nearly superseded in ecclesiastical ornamentation by the monogram of Jesus, a combination of the Greek letters ΙΗΣ, the abbreviation of ΙΗΣΟΥΣ. In the time of Charlemagne monograms were in general use on coins and seals, and in manuscripts. His own monogram occurs as a subscription to a document in the British museum of the date 801; as will be seen by the illustration, it takes in all the letters of his name (Karolus). The popes and many other sovereigns of the middle ages used monograms for signatures, as did also the early painters, engravers, and printers. Many modern monograms are but imitations of mediæval ones, but the taste for their use on seals, plate, paper, &c., has led to the production of designs which excel the best middle-age examples both in beauty and in intricacy.—See Bruliot, *Dictionnaire des monogrammes* (2d ed., 3 vols. 4to, Munich, 1832-'43); Binterim, *Die vorzüglichsten Denkwürdigkeiten der christlichkatholischen kirche* (7 vols., Mentz, 1825-'33); and Nagler, *Die Monogrammisten*, &c. (4 vols. 8vo, Munich, 1857-'63).



Monogram of Charlemagne.

MONOMANIA. See INSANITY.

MONONA, a W. county of Iowa, separated from Nebraska by the Missouri river, and intersected by the Little Sioux; area, about 900 sq. m.; pop. in 1870, 3,654. It is covered with prairie and has a fertile soil. The Sioux City and Pacific railroad passes through it. The chief productions in 1870 were 88,990 bushels of wheat, 285,457 of Indian corn, 50,346 of oats, 24,026 of potatoes, 18,783 lbs. of wool, 85,611 of butter, and 16,182 tons of hay. There were 1,413 horses, 6,374 cattle, 4,043 sheep, and 2,732 swine. Capital, Onawa.

MONONGAHELA RIVER, one of the head branches of the Ohio, formed by the union of the West fork and Tygart's Valley river in Marion co., W. Va., flows N. into Pennsylvania, where it receives the Cheat river, its principal tributary, and the Youghiogheny, and unites

with the Alleghany to form the Ohio at Pittsburgh; length, exclusive of branches, about 150 m., or including the Tygart's Valley river or East fork (which rises in Randolph co., W. Va.), 300 m. At its mouth the width is nearly 400 yards. It is navigable for large boats to Brownsville, Pa., 60 m. from its mouth, and for small boats to Fairmont, W. Va., at its head.

MONONGALIA, a N. county of West Virginia, bordering on Pennsylvania, and intersected by Monongahela and Cheat rivers; area, about 500 sq. m.; pop. in 1870, 13,547, of whom 231 were colored. The surface is uneven, being mountainous toward the east, where it is crossed by Laurel hill, an extreme western ridge of the Alleghanies; the soil is fertile. The Baltimore and Ohio railroad passes through the S. W. part. The chief productions in 1870 were 111,805 bushels of wheat, 301,328 of Indian corn, 148,072 of oats, 23,772 of potatoes, 55,856 lbs. of wool, 345,573 of butter, and 12,030 tons of hay. There were 4,238 horses, 8,110 cattle, 17,371 sheep, and 7,324 swine; 7 flour, 3 lumber, and 2 woollen mills, and 8 tanneries. Capital, Morgantown.

MONOPHYSITES (Gr. *μονοφυσίται*, from *μῦνος*, single, and *φύσις*, nature), the followers of Eutyches, who maintained that in Christ there is "only one nature, that of the incarnate word," his human nature having been absorbed by the divine. Eutyches had been led to maintain the mixture or confounding of the divine and human natures in Christ, against Nestorius, who taught that "the divine nature was not incarnate in Jesus, but only attendant on him, being superadded to his already formed human nature." Eutyches was warmly supported by the monasteries of Constantinople, and by those of Egypt, headed by Dioscurus, bishop of Alexandria. His opinion, condemned in 448 at Constantinople, was reaffirmed by the "robber synod" of Ephesus in 449, through the influence of Dioscurus and his partisans, aided by the abbot Barsumas and his Syrian monks, but especially through the active support of the emperor Theodosius II. This decision was reversed in 451 by the general council of Chalcedon, which decreed that after the incarnation the one and same Christ subsists in both natures without mixture, change, division, or separation. This decision, which the Eutychians termed sheer Nestorianism, only made them more tenacious of their doctrine. Hence they were called Monophysites by their opponents, who in turn were denominated indiscriminately Diophysites or Nestorians. The great patriarchal sees of Alexandria, Jerusalem, and Antioch, chiefly by means of the numerous monasteries of monks tainted with Eutychianism, fell into the possession of the Monophysites, and these cities, with their dependent churches, were for a long time scenes of the most scandalous and sanguinary violence. The perpetual interference of the Greek emperors in theological disputes, as it had not a little helped the growth of the Nestorian and Euty-

chian heresies, contributed also to perpetuate the division between the orthodox and the Monophysites. The usurper Basiliscus in 476 was the first emperor to issue doctrinal edicts obligatory on all upholding Monophysitism. In 477 the emperor Zeno gave his support to the Catholics, and in 482 he published a doctrinal compromise called *Henoticon*, which was condemned at Rome and rejected by both parties. Every attempt at reunion thenceforward made by the imperial authority only served to widen the breach. The emperors Justin and Justinian employed alternately, without success, measures of conciliation and severity. While Justinian tried to win the Catholics by proscribing the writings of Origen favorable to the Monophysites, he irritated them by condemning what is known as the "three chapters," namely, passages from three Antiochian church teachers, tainted with Nestorianism, but justified at Chalcedon. At the same time Justinian's wife Theodora was a most ardent propagandist of Monophysitism. The general council of Constantinople, convened in 553 by that emperor, created irremediable division, on the one hand by the condemnation of the Monophysite tenets, and on the other by the violence done to Pope Vigilius, and the condemnation of the "three chapters." The Monophysites, in the mean while, had fallen out among themselves; some (the Severians) maintaining the corruptibility, others (the Julianists) the incorruptibility of the body of Christ. By adopting the latter doctrine Justinian made (in 564) a last attempt to draw over the Monophysites, but with no other result than to cause a new split among the Catholic bishops. Under his successor the efforts to make the Monophysites accept the decrees of Chalcedon were given up, and they organized as an independent body. The zeal of Jacobus Baradaeus, who in 541 was ordained bishop of Edessa, gave them in Syria and Mesopotamia a permanent organization, with a patriarch, claiming to be the legitimate successor of the Antiochian patriarchs, at their head. They also received from him the name Jacobites, by which they were thenceforth commonly called. (See JACOBITES.) As early as 527, the bishops of Armenia rejected at a national synod, under the presidency of their patriarch Nerses, the decrees of Chalcedon, and organized on a Monophysitic basis an independent church. (See ARMENIAN CHURCH.) In Egypt nearly all the churches adopted Monophysitism; the few adherents of the imperial decrees were called Melchites (*i. e.*, royalists), while the Monophysites received the name of Coptic (*i. e.*, Egyptian) Christians. (See COPTS.) With this latter branch of Monophysitism the Abyssinian church is in organic connection. Some smaller branches of these four Monophysitic churches spread in other parts of western and in central Asia, but without attaining to any importance.—The history of the Monophysites is most amply treated of by Walch, in his *Ketzerhistorie*, vols. vi.,

vii., and viii. An extensive extract from this work is given in Schröckh's *Kirchengeschichte*, vol. xviii. Writings and fragments of the party leaders are contained in Mai's *Scriptorum Veterum Nova Collectio*, vol. vii., and *Spicilegium Romanum*, vol. vii. (See MONOTHELITES.)

MONOPOLI, a seaport town of Italy, in the province and 25 m. S. E. of the city of Bari, on the Adriatic; pop. about 12,000. It is the see of a bishop, and has a cathedral with a fine painting of St. Sebastian by Palma, and a chapel enriched with inlaid marbles of all colors. The town has two harbors, which accommodate large vessels, but one of them is exposed to the N. E. wind, which often blows with great violence in the Adriatic. There are extensive manufactures of cotton and linen cloths. About 3 m. from the town are ruins of the ancient seaport Egnatia, which was early the see of a bishop and was destroyed in the 9th century.

MONOTHELITES (Gr. *μονοθελίται*, from *μόνος*, single, and *θέλειν*, to will), the name of a sect which maintained that in Christ there was but one will and one voluntary operation, while they admitted the doctrine of two whole and distinct natures after the incarnation. The origin of Monothelitism was due to the effort made by the emperor Heraclius to conciliate the numerous Monophysite churches. (See MONOPHYSITES.) At the suggestion of Sergius, patriarch of Constantinople, a profession of faith was drawn up affirming that in Christ there is "only one mode of willing and working," and this was embodied in 639 in an imperial edict called *Ecthesis*. Cyrus, patriarch of Alexandria, at the instance of Sergius, made this formula a part of a doctrinal compromise, which was adopted by an assembly of Monophysite bishops held in that city, and thus led to the reunion of a large number of Monophysite churches. Sophronius, then a priest of Alexandria, strenuously but vainly opposed the adoption of this formula; and being soon afterward chosen patriarch of Jerusalem, he denounced the compromise in his inaugural letter to the bishops of Christendom. Sergius thereupon wrote to Pope Honorius I. requesting him to use his authority with Sophronius, and forbid the use of formulas expressing the existence in Christ of two wills and two voluntary operations. To this request Honorius assented. (See HONORIUS.) But after his death (638), the bishops of Rome placed themselves at the head of the opposition, and a new decree of the emperor Constant II., called *Typos* (648), designed to enforce peace by a prohibition of the controversy, had not the desired effect. The first council of Lateran (649) under Pope Martin I. condemned the Monothelites and the two imperial laws. The pope suffered imprisonment and died in exile for this decree, but some years later (680) the sixth œcumenical council, held at Constantinople, recognized in Christ two wills made one by the moral subordination of the human. The Monothelites obtained once more a transient

victory under Philipppicus Bardanes (711-'13), who had been brought up by the patriarch Macarius; but after the elevation of Anastasius II. to the throne, all the Monothelites were forced to submit, and the sect maintained itself only in a corner of Asia, outside of the Byzantine boundaries, until the 12th century, when they united with the Roman Catholic church. (See MARONITES.)—A history of the Monothelite heresy was written by Combefis, in his *Auctuarium Patrum*, vol. ii. (Paris, 1648).

MONOTREMATA (Gr. *μόνος*, single, and *τρήμα*, opening), an order of implacental mammals; the name is derived from the fact that the intestinal, generative, and urinary organs open into a common cloaca, as in birds and reptiles. The order includes the ornithorhynchus and the porcupine ant-eaters (*echidna*), from Australia and Tasmania. They are the lowest mammals, and have many characters of birds and reptiles in their structure and mode of reproduction; they have no abdominal pouch, but the marsupial bones are present; at the top of the breast bone is an episternum with lateral arms forming the chief support of the scapular arch, on the top of which the true clavicles, like the furcular bone of birds, are situated; the coracoid bones extend also to the sternum, and are surmounted by epicoracoid bones; in the scapular arch, therefore, they resemble in some respects birds, in others lizards and enaliosaurians. The eyes are very small, the external ears absent, and the face projects in the form of a naked beak, without teeth or soft movable lips; the teeth are replaced by small horny plates; some authors, as Wagner, have ranked them among edentates. The feet are five-toed, with long nails; the males have a long spur on the hind legs, the groove of which communicates with a glandular organ, whose secretion has been erroneously supposed to be poisonous; the mammary orifices are mere slits in the skin of the abdomen, without elevated nipples, and the female sexual organs resemble those of birds; the young are born alive, and are suckled as in other mammals; the cæcum is small; the lungs are spongy and cellular, and enclosed in a thoracic cavity separated from the abdomen by a diaphragm; in the brain there is no *corpus callosum*, and the bigeminal bodies are simple. (See ORNITHORHYNCHUS, and PORCUPINE ANT-EATER.)

MONREALE, a town of Sicily, in the province and 4 m. S. W. of the city of Palermo, on a steep hill called Monte Caputo; pop. about 16,000. It is the seat of an archbishop, and has one of the most imposing cathedrals of Sicily, containing the tombs of several Norman kings of the 12th century. There is a brisk trade in corn, oil, and fruit raised in the vicinity. Monreale grew up around a splendid Benedictine abbey and church (now the cathedral) founded by the Norman king William the Good in 1174, and took its name (Royal Mount) from its royal origin.

MONRO, Alexander, an English anatomist, born in London, Sept. 19, 1697, died in Edinburgh, July 10, 1767. In 1720 he began at Edinburgh a course of lectures on anatomy and materia medica, which were the first regular lectures on the medical sciences ever delivered in that city. On the foundation of the Edinburgh faculty of medicine in 1721, Dr. Monro was appointed professor of anatomy. The royal infirmary of Edinburgh was founded under his direction, and he lectured there on surgical science till 1759, when he resigned his lectureship to his son Alexander, who was the author of several treatises on physics. The father's most important work is "Osteology, or a Treatise on the Anatomy of the Bones" (1726), which was translated into many foreign languages. Some of his contributions to scientific journals were reprinted under the titles "Medical Essays and Observations" and "Essays Physical and Literary." His complete works, edited by his son Alexander, with a memoir by his son Donald, were published in Edinburgh in 1781.

MONROE, the name of 17 counties in the United States. **I.** A N. W. county of New York, bounded N. by Lake Ontario and drained by the Genesee river; area, 682 sq. m.; pop. in 1870, 117,868. The surface is generally level, with a slight inclination toward the lake. The soil is very fertile. The county is intersected by the New York Central and several other railroads, and the Erie and Genesee Valley canals. The chief productions in 1870 were 1,051,520 bushels of wheat, 802,261 of Indian corn, 1,217,955 of oats, 480,968 of barley, 990,998 of potatoes, 134,184 of peas and beans, 70,095 lbs. of tobacco, 337,394 of hops, 385,443 of wool, 1,631,050 of butter, 39,558 of cheese, and 74,453 tons of hay. There were 17,151 horses, 16,163 milch cows, 13,172 other cattle, 70,546 sheep, and 17,371 swine. There were 1,160 manufacturing establishments, employing \$10,951,090 capital, with annual products amounting to \$23,745,407. The chief industries, besides a large number of nurseries for fruit and ornamental trees and plants, were 17 manufactories of agricultural implements, 19 of boots and shoes, 65 of carriages and wagons, 82 of men's clothing, 1 of edge tools, 20 of furniture, 4 of hats and caps, 22 of iron castings, wrought iron, &c., 17 of machinery, 3 of paper, 4 of perfumery and fancy goods, 39 of tin, copper, and sheet-iron ware, 17 tanneries, 30 flour, 17 saw, and 4 planing mills, 3 distilleries, and 18 breweries. Capital, Rochester. **II.** An E. county of Pennsylvania, separated from New Jersey by the Delaware river; area, 600 sq. m.; pop. in 1870, 18,362. The surface in some parts is mountainous, and the soil of the valleys is rich. Limestone and slate are found. It is traversed by the Delaware, Lackawanna, and Western railroad. The chief productions in 1870 were 37,062 bushels of wheat, 72,424 of rye, 175,040 of Indian corn, 113,470 of oats,

79,165 of buckwheat, 103,816 of potatoes, 12,039 lbs. of wool, 298,168 of butter, and 17,973 tons of hay. There were 2,870 horses, 4,206 milch cows, 3,713 other cattle, 3,974 sheep, and 5,441 swine; 12 flour, 14 saw, and 2 woollen mills, and 12 tanneries. Capital, Stroudsburg. **III.** A S. county of West Virginia, bordering on Virginia, drained by Greenbrier and New rivers; area, 450 sq. m.; pop. in 1870, 11,124, of whom 1,003 were colored. It has an elevated surface, and is bounded E. and S. by the Alleghanies. It is one of the finest grazing counties in the state. The Chesapeake and Ohio railroad passes through the N. part. The chief productions in 1870 were 52,817 bushels of wheat, 11,320 of rye, 170,721 of Indian corn, 59,062 of oats, 12,164 of potatoes, 123,221 lbs. of tobacco, 26,694 of wool, 163,540 of butter, and 5,388 tons of hay. There were 2,555 horses, 3,006 milch cows, 7,169 other cattle, 11,517 sheep, and 5,747 swine. Capital, Union. **IV.** A central county of Georgia, bounded E. by the Ocmulgee river and drained by several branches; area, 370 sq. m.; pop. in 1870, 17,213, of whom 10,804 were colored. The surface is diversified, and much of the soil fertile. Gold, iron, granite, and plumbago are found. The county is intersected by the Macon and Western railroad. The chief productions in 1870 were 36,917 bushels of wheat, 241,251 of Indian corn, 21,286 of oats, 35,188 of sweet potatoes, 68,692 of butter, and 10,434 bales of cotton. There were 1,041 horses, 1,789 mules and asses, 2,173 milch cows, 589 working oxen, 3,485 other cattle, 1,754 sheep, and 11,018 swine. Capital, Forsyth. **V.** A S. county of Florida, forming the W. half of the extremity of the peninsula, bounded W. by the gulf of Mexico, S. W. by the bay of Ponce de Leon, N. by the Caloosahatchie river, and N. E. by Lake Okeechobee; area, 3,060 sq. m.; pop. in 1870, 5,657, of whom 1,026 were colored. In the S. part of the county lie the "Thousand Isles," and the Florida Keys are mostly included in it. The surface is mainly flat and marshy, and is partly occupied by the Everglades. The orange and the cocoa palm are indigenous. The productions are confined almost entirely to a few sweet potatoes, and most of the population centres at Key West. In 1870 the county contained 14,606 cattle. Capital, Key West. **VI.** A S. W. county of Alabama, drained and bounded S. W. by the Alabama river; area, 980 sq. m.; pop. in 1870, 14,214, of whom 7,572 were colored. The surface is moderately uneven and partly occupied by pine forests. The chief productions in 1870 were 232,486 bushels of Indian corn, 44,788 of sweet potatoes, 6,172 bales of cotton, 4,568 lbs. of wool, 45,037 of butter, and 10,629 gallons of cane molasses. There were 1,068 horses, 975 mules and asses, 3,134 milch cows, 1,134 working oxen, 6,406 other cattle, 3,237 sheep, and 10,746 swine. Capital, Claiborne. **VII.** A N. E. county of Mississippi, bordering

on Alabama and intersected by the Tombigbee river; area, about 700 sq. m.; pop. in 1870, 22,631, of whom 14,000 were colored. The surface is a plain, with few trees and covered with rank grass. The soil is a rich calcareous loam. The Mobile and Ohio railroad and its Aberdeen branch pass through it. The chief productions in 1870 were 12,249 bushels of wheat, 415,153 of Indian corn, 55,651 of sweet potatoes, 47,380 lbs. of butter, and 8,562 bales of cotton. There were 1,934 horses, 2,084 mules and asses, 3,458 milch cows, 4,963 other cattle, 4,272 sheep, and 19,599 swine. Capital, Aberdeen. **VIII.** An E. county of Arkansas, bounded S. W. by White river; area, 1,040 sq. m.; pop. in 1870, 8,336, of whom 3,200 were colored. The surface is generally level, and much of it occupied by cypress swamps. It is intersected by the Memphis and Little Rock railroad. The chief productions in 1870 were 184,358 bushels of Indian corn, and 7,334 bales of cotton. There were 1,256 horses, 893 mules and asses, 1,925 milch cows, 379 working oxen, 2,892 other cattle, 624 sheep, and 10,210 swine. Capital, Lawrenceville. **IX.** A S. E. county of Tennessee, bordering on North Carolina; area, 500 sq. m.; pop. in 1870, 12,589, of whom 1,235 were colored. It is drained by Tellico river, an affluent of the Little Tennessee. The Unaka or Smoky mountain lies on the S. E. border. The soil is moderately fertile. The East Tennessee, Virginia, and Georgia railroad passes through it. The chief productions in 1870 were 113,753 bushels of wheat, 415,010 of Indian corn, 56,367 of oats, 15,324 lbs. of wool, and 2,177 tons of hay. There were 2,334 horses, 2,539 milch cows, 6,415 other cattle, 8,346 sheep, and 13,422 swine. Capital, Madisonville. **X.** A S. county of Kentucky, bordering on Tennessee and drained by the head streams of Big Barren river and by the Cumberland river; area, 600 sq. m.; pop. in 1870, 9,231, of whom 789 were colored. The surface is diversified and the soil fertile. The chief productions in 1870 were 37,367 bushels of wheat, 747,660 of Indian corn, 112,275 of oats, 13,649 of Irish and 11,899 of sweet potatoes, 674,696 lbs. of tobacco, 33,353 of wool, and 121,854 of butter. There were 4,686 horses, 2,148 milch cows, 5,178 other cattle, 11,505 sheep, and 16,137 swine. Capital, Tompkinsville. **XI.** A S. E. county of Ohio, separated from West Virginia by the Ohio river; area, 420 sq. m.; pop. in 1870, 25,779. The surface is hilly and well timbered. It contains beds of coal, and some iron. The chief productions in 1870 were 161,042 bushels of wheat, 629,846 of Indian corn, 306,425 of oats, 98,678 of potatoes, 2,845,525 lbs. of tobacco, 158,066 of wool, 524,887 of butter, and 18,091 tons of hay. There were 7,060 horses, 8,358 milch cows, 10,048 other cattle, 42,198 sheep, and 18,661 swine; 29 manufactories of cheese, 7 of furniture, 1 of woollen goods, 12 tanning and currying establishments, 7 flour mills, 7

saw mills, and 1 planing mill. Capital, Woodsfield. **XII.** A S. W. county of Indiana, watered by White river and its branches; area, 420 sq. m.; pop. in 1870, 14,168. The surface is hilly, and the soil fertile. The Louisville, New Albany, and Western railroad passes through it. The chief productions in 1870 were 130,043 bushels of wheat, 454,275 of Indian corn, 105,415 of oats, 42,146 of potatoes, 15,947 lbs. of tobacco, 49,798 of wool, 253,078 of butter, and 7,311 tons of hay. There were 4,612 horses, 3,451 milch cows, 6,655 other cattle, 18,272 sheep, and 18,614 swine; 9 manufactories of carriages, 1 of wagon material, 1 of agricultural implements, 2 of woollen goods, 1 planing mill, 12 saw mills, 6 tanneries, 3 currying establishments, and 5 flour mills. Capital, Bloomington. **XIII.** A S. W. county of Illinois, bounded E. by the Kaskaskia river, and W. by the Mississippi; area, 360 sq. m.; pop. in 1870, 12,982. The surface is moderately uneven, and the soil is fertile. The chief productions in 1870 were 651,767 bushels of wheat, 543,718 of Indian corn, 152,451 of oats, 67,119 of potatoes, 103,083 lbs. of butter, and 5,243 tons of hay. There were 4,205 horses, 2,715 milch cows, 1,616 other cattle, 2,020 sheep, and 13,286 swine; 6 manufactories of saddlery and harness, 1 brewery, and 7 flour mills. Capital, Waterloo. **XIV.** A S. E. county of Michigan, bordering on Lake Erie and Ohio; area, 540 sq. m.; pop. in 1870, 27,483. Huron river forms the N. E. boundary, and it is intersected by Raisin river. The surface is level and diversified by prairies and woodlands. The valley of Raisin river is celebrated for fertility and beauty. The county is traversed by the Flint and Père Marquette and the Lake Shore and Michigan Southern railroads. The chief productions in 1870 were 249,086 bushels of wheat, 399,583 of Indian corn, 260,913 of oats, 268,373 of potatoes, 154,421 lbs. of wool, 894,265 of butter, and 44,896 tons of hay. There were 7,601 horses, 7,982 milch cows, 8,776 other cattle, 38,932 sheep, and 13,677 swine; 5 manufactories of agricultural implements, 10 of brick, 23 of carriages and wagons, 1 of tobacco and snuff, 8 flour mills, 10 tanneries, 33 saw mills, and 2 distilleries. Capital, Monroe. **XV.** A S. W. county of Wisconsin, watered by the La Crosse, Lemonweir, and Kickapoo rivers and other streams; area, 900 sq. m.; pop. in 1870, 16,550. The surface is undulating or broken, and the soil fertile. It is traversed by the Chicago, Milwaukee, and St. Paul, and the West Wisconsin railroads. The chief productions in 1870 were 478,447 bushels of wheat, 183,119 of Indian corn, 291,469 of oats, 91,836 of potatoes, 479,209 lbs. of hops, 39,228 of wool, 391,476 of butter, and 20,312 tons of hay. There were 3,232 horses, 4,621 milch cows, 6,583 other cattle, 12,341 sheep, and 6,413 swine; 5 manufactories of carriages and wagons, 2 of clothing, 8 of cooperage, 2 of machinery, 1 of wrapping paper, 3 of saddlery and harness,

1 of woollens, 14 saw mills, and 8 flour mills. Capital, Sparta. **XVI.** A S. county of Iowa, drained by several creeks; area, 430 sq. m.; pop. in 1870, 12,724. The surface is diversified, occupied partly by prairies, and the soil is fertile. The Burlington and Missouri River railroad and the Central railroad of Iowa pass through it. The chief productions in 1870 were 159,815 bushels of wheat, 754,692 of Indian corn, 185,173 of oats, 64,073 of potatoes, 72,052 lbs. of wool, 282,452 of butter, and 21,206 tons of hay. There were 5,122 horses, 4,687 milch cows, 9,271 other cattle, 21,168 sheep, and 21,739 swine; 1 woollen, 4 flour, and 6 saw mills. Capital, Albion. **XVII.** A N. E. county of Missouri, watered by Salt river and its branches; area, 744 sq. m.; pop. in 1870, 17,149, of whom 2,005 were colored. The surface consists in part of rich undulating prairies. The county abounds in coal, limestone, and freestone. It is traversed by the Hannibal and Moberly division of the Toledo, Wabash, and Western railroad. The chief productions in 1870 were 104,066 bushels of wheat, 589,127 of Indian corn, 304,275 of oats, 187,091 lbs. of tobacco, 68,772 of wool, 245,975 of butter, and 12,635 tons of hay. There were 9,765 horses, 2,989 mules and asses, 5,813 milch cows, 13,345 other cattle, 25,533 sheep, and 30,320 swine. Capital, Paris.

MONROE, a city and the county seat of Monroe co., Michigan, situated on both banks of the river Raisin, 2 m. above its entrance into Lake Erie, with which it is connected by a ship canal, and on the Michigan Southern, the Flint and Père Marquette, and the Canada Southern railroads, 32 m. S. S. W. of Detroit; pop. in 1850, 2,813; in 1860, 3,892; in 1870, 5,086; in 1874, 5,782. The harbor is good, and is protected by points of land jutting out from the river. The surrounding country is fertile. The city has many substantial brick blocks, handsome residences, and fine shade trees, and a park has been laid out in the centre of the business portion. The river affords excellent water power, and there are several foundries and machine shops, wagon and carriage shops, three grist mills, two saw mills, two plaster mills, three sash, door, and blind factories, a cabinet and furniture factory, a paper mill, &c. There are four extensive nurseries, and 156 acres of land in vineyards. Near the city is a deposit of sand from which large quantities are shipped to Pittsburgh, Wheeling, and other points, for the manufacture of glass. Monroe is the seat of a young ladies' collegiate institute, established in 1851, and having in 1873-'4 8 instructors, 109 students, and a library of 1,200 volumes. There are a national bank, three Roman Catholic and three Lutheran schools, a union school, several ward schools, two weekly newspapers, and seven churches. —The first permanent settlement here was made by a small party of Canadians in 1784, who called the place Frenchtown. The first American settlement was probably made about

1793. In 1813 it was the scene of the massacre of several hundred American prisoners by the Indian allies of the British. It began to grow after the close of the war of 1812, and its name was changed in honor of President Monroe.

MONROE, James, fifth president of the United States, born in Westmoreland co., Va., April 28, 1758, died in New York, July 4, 1831. His father was Spence Monroe, a planter, descended from Capt. Monroe, an officer in the army of Charles I., who emigrated with other cavaliers to Virginia in 1652. He was educated at William and Mary college, which he left in 1776 to enter the army as a cadet. Soon afterward he was commissioned lieutenant, and took an active part in the campaign on the Hudson. In the attack on Trenton, at the head of a small detachment, he captured one of the British batteries. On this occasion he received a ball in the shoulder, and was promoted to a captaincy. As aide-de-camp to Lord Stirling, with the rank of major, he served in the campaigns of 1777 and 1778, and distinguished himself in the battles of Brandywine, Germantown, and Monmouth. By accepting the place of aide to Lord Stirling he lost his rank in the regular line. Failing in his efforts to re-enter the army as a commissioned officer, he returned to Virginia and began to study law under the direction of Thomas Jefferson, then governor of the state. When the British appeared soon afterward in Virginia, Monroe exerted himself in organizing the militia of the lower counties; and when the enemy proceeded southward, Jefferson sent him as military commissioner to the army in South Carolina. In 1782 he was elected to the assembly of Virginia from the county of King George, and was appointed by that body, although but 23 years of age, a member of the executive council. In 1783 he was chosen a delegate to congress for three years, and took his seat on Dec. 13. Convinced that it was impossible to govern the country under the old articles of confederation, he advocated an extension of the powers of congress, and in 1785 moved to invest that body with authority to regulate trade between the states. The resolution was referred to a committee of which he was chairman, and a report was made in favor of the measure. This led to the convention at Annapolis, and the subsequent adoption of the federal constitution. Monroe also exerted himself in devising a system for the settlement of the public lands, and was appointed a member of the commission to decide upon the boundary between Massachusetts and New York. He strongly opposed the relinquishment of the right to navigate the Mississippi river, demanded by Spain. In 1785 he married a daughter of Lawrence Kortright of New York, a lady celebrated for her beauty and accomplishments. Having served out his term, and being ineligible for the next three years, Monroe settled in Fredericksburg, Va. In 1787 he was reelected to the general assembly, and in 1788 was chosen a delegate to the

Virginia convention to decide upon the adoption of the federal constitution. He was one of the minority who opposed the instrument as submitted, being apprehensive that without amendment it would confer too much power upon the general government. The course of the minority in convention was approved by the great mass of the people of Virginia, and Monroe was chosen United States senator in 1790. In the senate he became a prominent representative of the anti-federal party, and acted with it till his term expired in 1794. In May of that year he received the appointment of minister plenipotentiary to France, and was received in Paris with enthusiastic demonstrations of respect. His marked exhibition of sympathy with the French republic displeased the administration. John Jay had been sent to negotiate a treaty with England, and the course pursued by Monroe was considered injudicious and reprehensible, as tending to throw serious obstacles in the way of the proposed negotiations. On the conclusion of the treaty, his alleged failure to present it in its true character to the French government excited anew the displeasure of the cabinet; and in August, 1796, he was recalled, under an informal censure. On his return to America he published a "View of the Conduct of the Executive in the Foreign Affairs of the United States" (Philadelphia, 1798), which widened the breach between him and the administration; but Monroe remained upon good terms with both Washington and Jay. He was governor of Virginia from 1799 to 1802, and at the close of his term was appointed envoy extraordinary to the French government to negotiate, in conjunction with the resident minister, Mr. Livingston, for the purchase of Louisiana, or a right of depot for the United States on the Mississippi. Within a fortnight after his arrival in Paris the ministers secured for \$15,000,000 the entire "territory of Orleans" and "district of Louisiana." In the same year he was commissioned minister plenipotentiary to England, and endeavored to conclude a convention for the protection of neutral rights, and against the impressment of seamen. In the midst of these negotiations he was directed to proceed to Madrid, as minister extraordinary and plenipotentiary, to adjust the controversy between the United States and Spain in relation to the boundaries of the new purchase of Louisiana. In this he failed, and in 1806 he was recalled to England to act with Mr. Pinkney in further negotiation for the protection of neutral rights. On the last day of that year a treaty was concluded, but because of the omission of any provision against the impressment of seamen, and its ambiguity in relation to the other great points, the president sent it back for revival. All efforts to attain this failed, and Monroe returned to America. The time was approaching for the election of president, and a considerable body of the republican party had brought forward Monroe as their candidate;

but the preference of the president for Madison was well known. Monroe believed that the rejection of the treaty, and the predilection expressed for his rival, indicated personal hostility on the part of Mr. Jefferson, and a correspondence on the subject ensued. Jefferson candidly explained his course, and showed that his preference for Madison was solely based upon solicitude for the success of the party, the great majority of which had declared in his favor. The misunderstanding terminated, and Monroe withdrew from the canvass. In 1810 he was again elected to the general assembly of Virginia, and in 1811 governor of the commonwealth. In the same year he was appointed by President Madison secretary of state, and after the capture of Washington in 1814 he was appointed to the war department, which he took without relinquishing the former post. He found the treasury exhausted and the public credit at the lowest ebb; but he set about the task of infusing order and efficiency into the departments under his charge, and proposed an increase of 40,000 men in the army, by levying recruits throughout the whole country. His attention was also directed to the defence of New Orleans; and finding the public credit completely prostrated, he pledged his private means as subsidiary to the credit of the government, and enabled the city to successfully oppose the forces of the enemy. He was the confidential adviser of President Madison in the measures for the reestablishment of public credit and the regulation of the foreign relations of the United States, and continued to serve as secretary of state to the end of Madison's administration, in 1817. In that year he succeeded to the presidency, by an electoral vote of 183 out of 217, as the candidate of the party then generally known as democratic republicans. His cabinet was as follows: John Quincy Adams of Massachusetts, secretary of state; William H. Crawford of Georgia, secretary of the treasury; John C. Calhoun of South Carolina, secretary of war; Benjamin W. Crowninshield of Massachusetts, secretary of the navy; William Wirt of Virginia, attorney general. Calhoun and Wirt were not appointed until December, 1817. On Nov. 30, 1818, Secretary Crowninshield was succeeded by Smith Thompson of New York, who on Dec. 9, 1823, was succeeded by Samuel L. Southard of New Jersey. Soon after his inauguration, President Monroe made a tour through the middle and eastern states, during which he thoroughly inspected arsenals, naval depots, fortifications, and garrisons; reviewed military companies, corrected public abuses, and studied the capabilities of the country with reference to future hostilities. On this tour he wore the undress uniform of a continental officer. In every point of view the journey was auspicious. Party lines seemed about to disappear, and the country to return to its long past state of union. The president was not backward in his assurances of a strong de-

sire on his part that such should be the case. The course of the administration was in conformity with these assurances, and secured the support of an overwhelming majority of the people. The great body of recommendations in the president's message were approved by large majorities. The tone of debate was far more moderate; few of the bitter criminations which had been the fashion in the past were uttered; and the period became known as "the era of good feeling." Among the important events of the first term of President Monroe were the admission into the Union of the states of Mississippi, Illinois, and Maine. In 1818 a convention was concluded between Great Britain and the United States in relation to the Newfoundland fisheries, the restoration of slaves, and other subjects; and in 1819 Spain ceded to the United States her possessions in East and West Florida, with the adjacent islands. In 1820 Monroe was reelected president almost unanimously, receiving 231 out of 232 electoral votes. On Aug. 10, 1821, Missouri became one of the states of the Union, after prolonged and exciting debates, resulting in the celebrated "Missouri compromise," by which slavery was permitted in Missouri, but for ever prohibited elsewhere N. of the parallel of 36° 30'. Other events of public importance during the second term of President Monroe were the recognition in 1822 of the independence of Mexico, and the provinces in South America formerly under the dominion of Spain; and the promulgation, in his message of Dec. 2, 1823, of the policy of neither entangling ourselves in the broils of Europe, nor suffering the powers of the old world to interfere with the affairs of the new, now generally known as the "Monroe doctrine." On this occasion the president declared that any attempt on the part of the European powers to "extend their system to any portion of this hemisphere" would be regarded by the United States as "dangerous to our peace and safety," and would accordingly be opposed. On March 4, 1825, Monroe retired from office, and returned to his residence of Oak Hill, in Loudon co., Va. He was chosen a justice of the peace, and as such sat in the county court. In 1829 he became a member of the Virginia convention to revise the old constitution, and was chosen to preside over the deliberations of that body; but he was compelled by ill health to resign his post in the convention, and to return to Oak Hill. Pecuniary embarrassment was added to bodily infirmity, and although he had received \$350,000 for his public services, he was in his old age harassed by debt. His wife died in 1830, and in the summer of that year he removed to the residence of his son-in-law, Samuel L. Gouverneur, in the city of New York, where he died. In 1858 his remains were removed with great pomp to Richmond, Va., and reinterred on July 5 in the Hollywood cemetery.—Monroe held the reins of government at an important period, and

administered it with prudence, discretion, and a single eye to the general welfare. He went further than any of his predecessors in developing the resources of the country. He encouraged the army, increased the navy, augmented the national defences, protected commerce, approved of the United States bank, and infused vigor and efficiency into every department of the public service. His honesty, good faith, and simplicity were generally acknowledged, and disarmed the political rancor of his strongest opponents. Madison thought the country had never fully appreciated the robust understanding of Monroe. This may be partially accounted for by the fact that he never acquired distinction in oratory. In person, Monroe was tall and well formed, with a light complexion and blue eyes. The expression of his countenance was an accurate index of his simplicity, benevolence, and integrity.

MONS (Flem. *Bergen*), a fortified city of Belgium, capital of the province of Hainaut, on the river Trouille, 32 m. S. S. W. of Brussels; pop. in 1871, 27,764. It communicates with the Scheldt by the canal of Mons, and is connected by railways with Brussels, Namur, and Valenciennes. The E. side is protected by two large ponds, and the surrounding country may be flooded by admitting the river Trouille. The walls are in the form of a polygon, and have five gates and 14 bastions. The principal church is that of St. Wandru (Waltrudes), a fine Gothic edifice begun in 1460. Among other principal public buildings are the castle, the Gothic town hall, court house, theatre, arsenal, and military hospital. The town contains also a college, which in 1873 had 252 students, a school of art, a public library, and a society of art and science. There are several salt and sugar refineries. In the vicinity are coal mines which give employment to more than 25,000 persons. The coal basin in which the city is situated is called the Borinage, and the miners Borains. In coal, flax, hemp, grain, timber, horses, cattle, and manufactures an active trade is carried on.

MONSEIGNEUR (Fr. *mon*, my, and *seigneur*, lord), a French title once applied to saints, and subsequently to princes, nobles, certain high dignitaries of the church, and other titled personages. Under the monarchy the dauphin's eldest son was styled *Monsieur*, without any addition. The title is now given only to prelates. The Italian *monsignore* has a similar signification.

MONSERRAT, or *Montserrat*, a mountain in Catalonia, Spain, on the right bank of the river Llobregat, in the province and about 25 m. N. W. of the city of Barcelona. It is about 24 m. in circumference, and its summit consists of several jagged serrated peaks, the highest of which is 4,057 ft. above the sea. Far up the E. side stands the monastery of the same name, which owes its origin to an image of the Virgin, said to have been made by the apostle Luke and brought to Barcelona in A. D. 60 by

the apostle Peter. At the time of the Moorish invasion it was hidden in the hill, but was discovered in 880, and on a spot indicated, as was asserted, by the image, a chapel was built over it. A convent was founded, which was converted into a Benedictine monastery in 976. The chapel which now contains the image was founded in 1592. The monastery was suppressed in 1835, but some of the monks were allowed to remain. Several fortifications were made on this mountain during the peninsular war, as the high road from Manresa across the Llobregat traverses it. There is a multitude of shrines and hermitages. About 60,000 pilgrims and tourists annually visit the convent, and during the fête of the Virgin in September railway trains and omnibuses run continually from Barcelona.

MONSIEUR (Fr. *mon*, my, and *sieur*, sir), a French title of gentlemen, parallel in its original signification and use to the female title *madame*. Under the monarchy it was applied without the addition of the name to the king's eldest brother. It is now given to Frenchmen of every rank and condition. During the first revolution, and for brief periods in 1830 and 1848, *monsieur* was replaced by *citoyen*, citizen.

MONSOON (Arab. *mausim*, season, corrupted by the Portuguese into *monção*), an intertropical wind which blows part of the year from one point of the compass, and the remainder of the year in a contrary direction. These winds are more particularly known in the seas adjoining the great Asiatic continent and archipelago, including Papua and the N. part of Australia, whence they extend to about lon. 160° E. The causes which produce them are, in theory, the same as those generally supposed to cause the trade winds. When the sun is in N. latitude and comes over a large portion of Arabia, Hindostan, Burmah, and Cochin China, and these lands become heated to a much higher temperature than the surrounding equatorial sea and atmosphere, the cooler air flows toward these regions; and as they have less rotary velocity than the latitudes bordering upon the equator whence the current comes, it acquires a relative N. E. direction in passing to the north, and is called the S. W. monsoon. In the northern hemisphere, when the land is cooled by the sun being in S. latitude, the regular N. E. trade wind prevails throughout these seas, and what is called the N. E. monsoon is in reality the N. E. trade wind. South of the equator the S. E. trade wind continues to blow over all that part of the ocean which has not large tracts of land to the south; but where this is the case, as in the Java seas, and as far E. as New Ireland, we find the same causes operating again, and a N. W. monsoon taking the place of the regular S. E. trade wind when the sun has southern declination. These general laws, with trifling exceptions, apply to all monsoons; that is to say, when the S. W. monsoon blows N. of the equator, the wind blows from S. E. in the regions S. of the equator; and when the

N. W. monsoon prevails in S. latitude, the wind blows from N. E. in N. latitude.

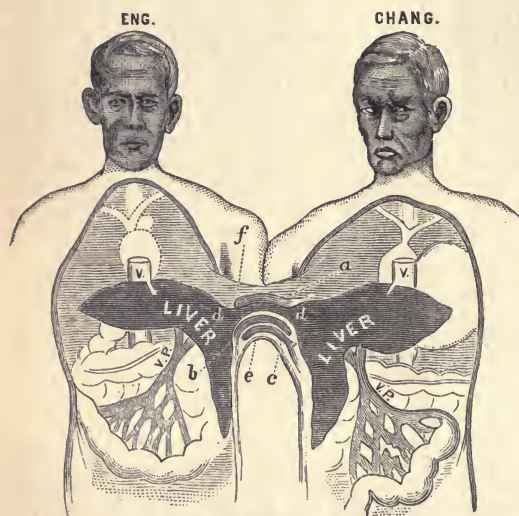
MONSTER, a term limited by Isidore Geoffroy Saint-Hilaire to the complex and grave congenital anomalies of conformation, disagreeable to the sight, rendering difficult or impossible the accomplishment of certain functions, and producing a disposition of organs very different from that ordinarily presented by the species, whether animal or vegetable, involving change in the form, structure, volume, position, and number of parts. This definition excludes simple vices of conformation, such as hare lip, club foot, fissured palate, gigantic and dwarfed stature, albinism, and hermaphroditism. The phenomena of monstrosity were not examined in a philosophical spirit until the early part of the present century, when the sciences of comparative anatomy and embryology could be brought to their explanation; the principal workers in the field at this period were the elder Geoffroy Saint-Hilaire, Serres, and Meckel. The history of monsters, or teratology, is a science in itself. In the fabulous period of this science, ending about the beginning of the 18th century, monsters were regarded as exhibitions of the creative power of God, as proofs of his anger and the signs of some approaching public calamity, or as the work of demons; and as such, by the old Greek and Roman laws, they were at once put to death; even as late as the 17th century they were either destroyed or shut up from human sight. In the first half of the 18th century the causes of monstrosity were zealously sought for, and from the time of Haller the science made rapid progress.—Many forms of monstrosity are embryonic conditions rendered permanent beyond the normal period, thus forming a series comparable to the ages of the fœtus and to zoological divisions of animals; others seem to be formed by excess of growth, according to the theories of original excess of productive power or eccentric development of the vascular system; double monsters, whether partial or complete, are united by homologous surfaces, side to side, back to back, or face to face, each internal organ of one having a corresponding organ in the other; and the laws regulating monstrosities, whether by excess or defect, are intimately connected with those presiding over normal organizations. It is true, as Goethe says, that "it is in her monstrosities that nature reveals to us her secrets." Isidore Geoffroy Saint-Hilaire (*Histoire des anomalies*, &c., 3 vols. 8vo, Paris, 1832-'6) makes the two classes of single and compound monsters, which he divides into orders, tribes, families, and genera on the Linnæan zoological plan; in the first class he places all such as have the elements of only a single individual, and in the second those which have the parts, complete or incomplete, of two or more individuals. In the first class he makes three orders: A. *Autosites*, or such as are capable of sustaining life, sometimes extra-uterine, by

their own organs, having a heart, lungs, almost all the digestive organs, and a portion at least of the head, most of the body remaining symmetrical and nearly normal. This order contains four subdivisions or tribes: I., in which the limbs are modified by deficient development or by fusion, or are absent; II., in which the viscera of the trunk are more or less seriously displaced and external, the limbs normal, incapable of extra-uterine life; III., in which the principal anomalies are in the cranium and brain, the modifications of the face and limbs being of secondary importance; the brain is deformed, incomplete, partially or wholly outside the cranial cavity, or even entirely absent, with corresponding deficiency in the arch of the skull; this includes an extensive series both in man and animals, among others the so-called anencephalous fetuses, all incapable of life beyond a few hours or perhaps days; in some the spinal canal is largely open, and the spinal cord as well as the brain absent; IV., in which the face is more deformed than the cranium, the nasal apparatus being atrophied or displaced, bringing the eyes near together, or the central region of the face so deficient that the ears are joined on the median line; this includes the one-eyed monsters, like the fabulous Polyphemus, and rhinencephalous fetuses; all these die speedily from the imperfection of the brain. B. *Omphalositæ*, living a merely vegetative life ceasing with the separation from the parent, many of the organs being absent and the existing ones very imperfect with abnormal and unsymmetrical forms; these include the parencephalous and acephalous fetuses, the former having some traces of cranium, but no heart sufficient to circulate blood, and the latter destitute of head except the merest rudiments, often having neither neck nor chest, and but few of the abdominal organs; they never reach the full term of gestation. C. *Parasitæ*, including the imperfect products of conception commonly called moles; they are irregular in form, composed principally of bones, teeth, hairs, and fat, having no umbilical cord, and implanted directly on the parent organs, where they live a vegetative and parasitic life; in most cases these appear to be a deformed and abnormally developed placenta, with a few remains of the prematurely dead embryo; they have been found attached to the uterus and the ovaries, and the gestation has usually been much prolonged, even to years, some of the second teeth having been seen in their substance.—In the second class, or that of compound monsters, the double ones he divides into *autositaires*, in which the two individuals present the same degree of development, each having an equal share in the life common to both, a union of two *autosites*; and *parasitaires*, composed of two very unequal or dissimilar individuals, one complete and the other imperfect, and the latter capable of living only at the expense of the former. The tribes of the *autositaires* are: I. That in which the

individuals are united only in a single region, the duplicity being complete in every other part. This tribe is naturally subdivided into two families, according as the umbilicus is double or single; in the former belong the double monsters united by any portion of the trunk or head, like the famous Hungarian sisters, Helen and Judith, joined back to back by the thighs and loins; these were born in 1701, and lived to their 22d year; they had neither the same temperament nor character, and Helen was larger, better looking, more active, intelligent, and gentle than her sister; they were very fond of each other, performed some physiological acts in common and others separately, and were sick and died together. Two black children, called the Carolina sisters, Christina and Millie, united by the lower part of the backs, have been exhibited in various parts of this country and Europe; in 1869, when they were 18 years old, they were apparently in perfect health. A full description of them is given in the "Boston Medical and Surgical Journal" for July 8, 1869, from which it appears that the hips are so far separated that on one side two fingers can be passed in between them, there being only a crease on the other side. The call to evacuate the bowels and bladder is simultaneous, and the intestines must therefore unite not far above their termination; there is a single anus and rectum between the anterior limbs, and the two urethral orifices and vaginæ open into a common vulva. The mammary development is good, though the chests are considerably deformed from spinal curvature; menstruation is regular. If hunger and thirst be felt in both at the same time, it must be through nervous connections. They are two individuals, psychologically, morally, and legally; one may be awake and the other asleep; their general health is good, the weight being 170 lbs., about equally divided between them; their expression is cheerful, manners agreeable, and intelligence above the average; they sing together with good effect. They are inclined to rest on the back legs, and walk upon these, or upon all four, moving sidewise; the front legs are a little the shortest, from the elevation of the front hips from spinal curvature; they can walk rapidly, and even waltz. They are united by the sacrum, and probably by the lower lumbar vertebrae; both feel a touch upon the lower limbs, indicating that the sensory nerves, from the posterior columns, mingle at the lower part of the spine; but the motor nerves, from the anterior columns, are so distinct that one cannot move the limbs of the other. (See *Annales d'hygiène publique*, Paris, April, 1874.) To the family with a single umbilicus belong such as are joined in the hypogastric and sternal regions, front and sides of thorax, and sometimes even by the neck and jaws. Among those united by the xiphoid region of the sternum were the Siamese twin brothers, Chang and Eng, having a single um-

bilicus in the centre of the moderate-sized connecting process. They were born in 1811, were exhibited in most parts of Europe and the United States, and died, within a few hours of each other, in North Carolina, Jan. 17, 1874; each was married, and had several children, none of whom were monsters. They were physiologically distinct, having different forms, strength, tastes, and dispositions; their physical functions were performed separately; the sickness of one did not affect the other; hence there could not have been any free interchange of circulations. In the connecting ensiform cartilage, the post-mortem examination showed that the band contained four peritoneal pouches, two of which met and overlapped on the median line, and that their

are distinct at the pelvic extremity, but connected in the head and sometimes in the whole supra-umbilical region. In one family the bodies are united from the umbilicus upward, with the head more or less completely double, in some with the two faces directly opposite; as far as known, this deformity is incompatible with life. In another family the trunks are joined above the umbilicus, with a single head bearing but few marks of duplicity, and with two or four thoracic limbs; both these families occur in man, but the latter very rarely. Tribe III. includes such as have the head double, but the trunks more or less united into a single body and two lower extremities; sometimes the bodies are distinct from the umbilicus upward, with generally a rudimentary third lower



The Siamese Twins.

V. Vena cava. V.P. Vena portæ. a. Upper hepatic pouch of Chang, probably continuous during fetal life. b. Peritoneal or umbilical pouch of Eng. c. Lower peritoneal or umbilical pouch of Chang. d. e. Connecting liver band, or tract of portal continuity. e. Lower border of band. f. Upper border of band.—There was also an upper hepatic pouch from the liver of Eng, not represented, as it was not discovered till the organ was removed.

livers and hepatic vessels communicated, though not freely, indicating that any attempt during life to separate them would probably have proved fatal; whether, had there been time and opportunity, the separation of the living from the dead would have been fatal, may admit of doubt. Chang died first, probably of cerebral clot, during the night; when Eng awoke and found his brother dead, his fright and the consequent nervous shock, acting on an enfeebled heart, produced a fatal syncope. There was a region of common sensibility in the median line of the band. Though these lived to the age of 63 years, in the last named members of the group the anomaly is generally incompatible with extra-uterine life. Tribe II. comprises monsters in which the individuals

bring forth twins have been found most liable to produce monsters, the separate amnions of each from contiguity favoring the confusion or blending of parts; the birth is usually premature, though sometimes long after the natural time. The hereditary transmission of monstrosity is very rare, even when the reproductive functions are unimpaired. The female sex seems to predominate, taking the whole range of monsters. Monstrosity is more common and extraordinary in the vegetable than in the animal kingdom, from the easier derangement and displacement of parts; yet even here it is subject to and explicable by the laws of normal vegetable growth; some botanists consider double flowers and other similar products arising from peculiar culture as monsters, and

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such as these are perpetuated by seed. Monstrosity may be due to an absence of formation; to an arrest of development, an embryonic structure remaining permanent; to an excess of development; and to a union of parts, more or less normal, belonging to different individuals. Prof. J. Wyman ("Proceedings of the Boston Society of Natural History," 1867), in a paper on symmetry and homology in limbs, draws attention to the analogy between symmetry and polarity, illustrating his remarks by figures; he thus explains both normal and abnormal development, and the various kinds of double monsters. Though it is impossible to admit the action of slight causes, of momentary continuance, popularly believed to be connected with monstrous or imitative growths, still the artificial production of variously deformed and imperfect chicks by the shaking, or malposition, or unnatural treatment of eggs, shows that appreciable external causes may occasionally be satisfactorily traced; it is now generally conceded that prolonged unfavorable circumstances during pregnancy may lead to monstrous growths.—See the works quoted by Geoffroy Saint-Hilaire, and the papers of G. J. Fisher, M. D., in the "Transactions of the New York Medical Society" (1865-'8). (See TERATOLOGY.)

MONSTRELET, Enguerrand de, a French chronicler, born in Cambrai about 1390, died July 20, 1453. He filled several offices in Cambrai, being bailiff of the chapter, provost of the city, and bailiff of Wallaincourt. His chronicle is in two books, extends from 1400 to 1444, and comprises an account of the capture of Paris and the conquest of the French monarchy by Henry V., and of the wars which resulted in the expulsion of the English from most parts of France. His style has none of the animation and picturesqueness of Froissart, but it is marked by dignity, simplicity, and accuracy. The latest edition is that of L. Douët-d'Aroq (6 vols. 8vo, Paris, 1857-'62). The best English version is by the Rev. Thomas Johnes (13 vols. 8vo, London, 1810). Appended to the earlier editions of Monstrelet are two spurious books continuing the history to 1467.

MONTAGU, Basil, an English lawyer, born in London, April 24, 1770, died in Boulogne, Nov. 27, 1851. He was a natural son of John Montagu, fourth earl of Sandwich, and Miss Ray, who was shot in 1779 at Covent Garden by the Rev. James Hackman, a frantic admirer. Basil graduated at Cambridge, was called to the bar in 1798, and acquired a large practice in cases of bankruptcy. He formed an intimacy with that literary circle of which Coleridge was a leader, and became a convert to the political theories of Godwin. In 1806 Lord Chancellor Erskine made him a commissioner of bankrupts. Impressed with the evils of the law administered in his court, he published a yearly detail of its pernicious results, and ultimately induced its amelioration. Under the new law Mr. Montagu was appointed accountant general, in which capacity he com-

pelled the bank of England to pay interest (never previously demanded) on the moneys that had been deposited there by his court. He published 40 volumes, including several against capital punishment, and left, it is said, 100 volumes in manuscript. His principal professional work is "A Digest of the Bankrupt Laws" (4 vols. 8vo, London, 1805), of which several editions have been published. Of his editorial works the most important is his edition of "The Works of Francis Bacon" (16 vols. 8vo, 1825-'34), the last volume of which contains a "Life of Bacon" by the editor.

MONTAGU, Edward Wortley, an English author, born at Wharfedale, Yorkshire, in October, 1713, died in Padua, May 2, 1776. He was the only son of Edward Wortley and Lady Mary Wortley Montagu. He ran away from school, and went as a cabin boy to Spain, whence he was sent back to England by a British consul. He was next committed to the charge of a private tutor, and sent to travel on the continent. On returning to England he married a woman in very humble life, almost old enough to be his mother, lived with her but a few weeks, and then abandoned her. In 1747 he was returned to parliament for Huntingdonshire, but soon became so involved in debt that he had to resign. He went to France, and thence to Italy, where he became a convert to the Roman Catholic church; and from Italy to Egypt, where he turned Mohammedan. He was returning to England when he died. He published "Reflections on the Rise and Fall of the Ancient Republics," the authorship of which was claimed by his tutor, Mr. Foster. His "Autobiography" was published in 1869 (3 vols. 8vo, London).

MONTAGU, Elizabeth, an English authoress, born in York, Oct. 2, 1720, died in London, Aug. 25, 1800. She was the daughter of a Mr. Robinson of Horton in Kent. In 1742 she married Edward Montagu, a grandson of the first earl of Sandwich, who died in 1775, leaving her a large fortune. She made her house a favorite resort for literary characters, and one of the principal places of meeting of the blue stocking club. For many years she gave annual dinners on May day to the chimney sweeps of London. She was the author of three "Dialogues of the Dead," published with Lord Lyttelton's (1760), and wrote an "Essay on the Genius and Writings of Shakespeare" (1769), in refutation of the criticisms of Voltaire. Her epistolary correspondence was published by her nephew, Matthew Montagu (2 vols., 1809). See also her life as illustrated by her correspondence in "A Lady of the Last Century," by Dr. John Doran (London, 1872).

MONTAGU, Lady Mary Wortley, an English authoress, eldest daughter of Evelyn Pierrepont, duke of Kingston, born at Thoresby, Nottinghamshire, about 1690, died Aug. 21, 1762. She was related through her father to Beaumont the dramatist, and through her mother to Fielding the novelist, who was her second

cousin. Her beauty and wit made her the pet of her father, and she acquired the elements of Greek, Latin, and French under the tuition of her brother's preceptors. At the age of 12 she wrote a poetical epistle from Julia to Ovid; at 15 she was meditating the establishment of an English nunnery, and was correcting her education by extensive reading; at 20 she made a translation of the *Enchiridion* of Epictetus. Meantime she lived principally at Thoresby and at Acton, near London, and as the eldest daughter of a widower presided at the dinner table and exerted her social powers in the entertainment of guests. In 1712 she was privately married to Edward Wortley Montagu. A disagreement concerning the settlements had caused the duke of Kingston to withhold his consent, and the union did not prove happy. They lived in the country till after the accession of George I. in 1714, when Mr. Montagu joined the ministry as one of the lords of the treasury. Lady Mary, on her first appearance at St. James's, was hailed with universal admiration, as much for her conversation as for her beauty. In 1716 she accompanied her husband to Constantinople, whither he was sent as ambassador to the Porte and as consul general in the Levant. Her letters descriptive of the court and society of Vienna, and the scenery and customs of the East, which rank among the choicest publications of their class, were published surreptitiously after her death (3 vols., 1763), under circumstances which afforded no guarantee for their authenticity; this, however, is in general proved by the coincidences of style with her other writings, though the text has been tampered with and spurious letters introduced; a fourth volume was published in 1767. At Belgrade she first observed the practice of inoculation for the smallpox, by which malady she had lost an only brother and her own fine eyelashes. In 1718 she applied the process after earnest examination to her son and daughter; and on her return to England the experiment was tried at her suggestion on five persons under sentence of death. The success of the trial did not prevent the most violent clamors against the innovation. On returning to England she had taken up her residence at Twickenham, at the solicitation of Pope, who had been one of her most intimate correspondents. A rupture soon took place between them, according to her statement, because she could not refrain from laughter when at an ill-chosen moment he was solemnly and passionately making love to her; and from that time he treated her with constant malice. She wrote many witty verses. In 1739 her health was declining in consequence of a cancer which ultimately proved fatal, and she went abroad. She took up her abode in a deserted palace on the shores of Lake Iseo, in Lombardy, and afterward in the city of Venice, where she was residing when her husband died in 1761. She then returned to England, and died within a

year. The best edition of her "Letters and Works" (3 vols., London, 1837), by her great-grandson Lord Wharnccliffe, containing full biographical notices, was critically revised for Bohn's "Historical Library" by Moy Thomas (1861). Her letters were edited by Mrs. S. J. Hale (New York, 1856).

MONTAGUE, a N. county of Texas, separated from Indian territory by Red river; area, 900 sq. m.; pop. in 1870, 890, of whom 24 were colored. There are some good bottom lands on Red river. The chief productions in 1870 were 2,473 bushels of wheat, 41,715 of Indian corn, 4,933 of oats, and 21,200 lbs. of butter. There were 383 horses, 687 milch cows, 10,182 other cattle, and 5,093 swine.

MONTAGUE, Charles, earl of Halifax, a British statesman, born at Horton, Northamptonshire, April 16, 1661, died May 19, 1715. His father was a younger son of the earl of Manchester. Charles was destined for the church, and was sent to Trinity college, Cambridge. He wrote there in 1685 some verses on the death of King Charles II., and in 1687 joined Prior in the composition of a parody in prose and verse on Dryden's "Hind and Panther" under the title of "The Hind and the Panther Transversed to the Story of the Country Mouse and the City Mouse." He signed in 1688 the invitation to the prince of Orange, was a member of the convention parliament, and soon afterward, having married the countess dowager of Manchester, gave up the church, and purchased the place of one of the clerks of the council. In 1690 he was again returned to the house of commons, where for some years his life was a series of triumphs. He was soon called to the treasury board and the privy council, and in 1694 was appointed chancellor of the exchequer, in reward for having devised the establishment of the bank of England, the plan of which had been proposed by William Paterson, three years before, but not acted upon. Montague was the originator of the great recoinage act (1695), of exchequer bills (1696), and of the tax on windows. On May 1, 1697, he was made first lord of the treasury, and appointed one of the regency during the king's absence on the continent; but on the reorganization of the ministry in 1699 he was removed to the auditorship of the exchequer. In 1700 he was created Baron Halifax. In April, 1701, he was impeached by the commons, together with Portland, Oxford, and Somers, for advising the king to sign the partition treaties and for other alleged offences; but the prosecution was dropped. After the accession of Queen Anne he was accused by the lower house of breach of trust in his management of the public accounts while chancellor of the exchequer; but he again escaped by the protection of the house of lords. He proposed and negotiated the union with Scotland in 1707, and was one of the judges in Sacheverell's trial, when he voted for a mild sentence. On the death of the queen he acted as one of

the regents, and after the accession of George I. (1714) was made earl of Halifax and first commissioner of the treasury.

MONTAIGNE, Michel, seigneur de, a French author, born at the château of Montaigne, in Périgord, Feb. 28, 1533, died there, Sept. 13, 1592. His father was an eccentric feudal baron. The young Montaigne was in his infancy placed under a German tutor, who could not speak French and was directed to confer with his pupil only in the classical tongues. The entire household and even the artisans and peasants of the village learned Latin phrases in order to address the youthful lord. At the age of six he was able to converse in Latin with ease, and his study of Greek had been transformed into a game, which however he never mastered. He was sent to the college of Guienne at Bordeaux, and at 13 completed the academical course. Love of liberty and laziness were, he says, his predominating qualities through life. He never looked over his accounts nor revised his manuscripts; wrote so badly that often he could not read his own hand; never touched a book except when he was weary of doing nothing; had an amazing ignorance of common things, which seemed the greater in consequence of his defective memory; could not remember the names of his servants nor of the current coins; would read a book as new which he had scribbled over with notes a year before; would forget his idea while on the way to the library to record it; knew nothing about the agricultural implements, processes, and products amid which he grew up; and could not swim, fence, carve, guess a riddle, saddle a horse, nor make a pen. He confesses that the only books of solid learning he could ever seriously devote himself to were Plutarch and Seneca. After quitting the college of Guienne he began the study of law, and at the age of 21 became a counsellor in the parliament of Bordeaux, an office from which he retired in 1570. There began his friendship with Étienne de la Boétie, whom he had loved before meeting him, whose early death he laments in one of the finest of his essays, and whose works he edited. He was inclined to an easy neutrality amid the religious and political conflicts of the time; made frequent visits to court, where he was intimate under successive monarchs; married at the age of 33; and at the age of 38 retired to his château. He soon after began the composition of his *Essais*; the first edition appeared in 1580, and the work was several times enlarged during his life. At his death he left two copies of the edition of 1588 full of corrections and additions, which were incorporated in the work by Mlle. de Gournay and subsequent editors. Suffering from the stone and nephritic colic, he sought relief by travel, and in 1580-'81 visited Germany, Switzerland, and Italy. The journal of his tour was discovered and published at Paris in 1774, after being entombed for nearly two centuries in the family

chest in the château of Montaigne. The humors of a valetudinarian seem to have chiefly engrossed his attention. He gauges civilization by the resources and the art of the kitchen. He passes through the scenes of classical antiquity with scarcely a reference to any Roman author. His vanity appears in his detailed accounts of attentions received from the great, and in his delusion of the burgomaster of Augsburg into the belief that he and his suite were a company of knights and barons. Some of his descriptions, especially of what he saw in Rome, are made with curious felicity. On his return he was elected mayor of Bordeaux, which office he held for four years, maintaining peace in a time of disorder; and after retiring to his domain in the very focus of civil war, he refused to fortify his house, leaving it "to the stars to guard," and afterward boasted that his bold frankness had conjured away all dangers from it. In 1588, while in Paris superintending the publication of his *Essais*, he was employed to mediate between Henry of Navarre, afterward Henry IV., and the duke of Guise. He left no sons, and by his will authorized Charron to assume his family arms. His *Essais*, to which alone he owes his reputation, profess to have been purely a work of amusement. Informal and irregular, they offer the first modern examples of essays or attempts in distinction from finished works. In an age of pedants, Montaigne appeared as the antagonist of literary conventionalism, and defied the pretensions of erudition. His sagacious treatment of every-day life, rich and vigorous language, easy and indulgent gayety, genial egotism, and minute confessions, are among the charms of his work. He employed the language of Christianity, and both Catholics and Protestants have claimed his sympathies; yet a practical heathenism pervades his philosophy. He was a kind of imperfect Socrates, the cross-examiner of his generation, taking nothing on trust, and hating pretence, yet too careless and selfish, and not pure and thorough enough, to give his ideas effect. A monument to him was inaugurated in Bordeaux, Sept. 6, 1858.—The latest editions of the *Essais* are one containing notes of all the commentators, collected by J. V. Le Clerc, with a preface by Prévost-Paradol (2 vols. 8vo, Paris, 1865); one by Courbet and Royer in Lemerre's new collection of great writers (1872 *et seq.*); and one reprinted from the edition of 1588 with annotations by H. Motheau and D. Jonaus (4 vols., 1874-'5). See also *Documents inédits sur Montaigne*, by Payen (4 vols., 1847-'56), and *Études sur les Essais de Montaigne*, by Alphonse Leveaux (1873). They were several times translated into English, and very frequently reprinted, in the 17th and 18th centuries. A copy of Florio's translation (1603), the only book known to have been owned by Shakespeare, is in the British museum with his autograph. One of the best biographies of Montaigne is by Bayle St. John (London, 1857).

MONTALANT, Mlle. See DAMOREAU.

MONTALEMBERT. I. Marc René de, marquis, a French military engineer, born in Angoulême, July 15, 1714, died March 29, 1800. He was descended from an ancient family of Poitou, early entered the army, and took an active part in the campaigns of Italy and Flanders, and in 1741 in the war of the Austrian succession. He devoted himself to military science, in 1747 became a member of the academy of sciences, and established foundries for casting cannon. His innovations in the art of fortification were opposed by the French engineers, but all doubts were dispelled by his successful construction of the fort of Ré. He was also employed in the fortifications of Anklam, Stralsund, and the islands of Aix and Oléron. He became a partisan of the revolution, and relinquished his pension in favor of the national convention. During the reign of terror he obtained a divorce from his first wife, an actress and novelist, and married the daughter of an apothecary. He had given up to the government his foundries, without receiving any equivalent, and was involved in further difficulties by the publication of his works, his various experiments for the improvement of the military art, and the depreciation of paper money. He had also executed at his own expense and presented to the government various models relating to fortifications and artillery. His services as a military reformer were publicly acknowledged by the convention and by the council of 500, and some inadequate pecuniary relief was afforded him. He wrote on the campaign of 1757, on the siege of St. Jean d'Acre, and a historical essay on the founding of cannon, and contributed valuable memoirs to the academy. His great work, *La fortification perpendiculaire, ou l'Art défensif supérieur à l'offensif* (11 vols. 4to, Paris, 1776-'96), with illustrations, absorbed a large portion of his fortune. His system of detached forts inaugurated a new era not only in fortification, but in the attack and defence of fortresses and in strategical science generally. His principles were adopted in the fortifications of Ehrenbreitstein, Cologne, Sebastopol, Cronstadt, and Cherbourg, in the batteries at the entrance of Portsmouth harbor, and in most modern forts for harbor defence. (See FORTIFICATION.) **II. Charles Forbes René de**, count, a French statesman, grandson of the preceding, born in London, May 29, 1810, died in Paris, March 13, 1870. He received his university education in Paris, and in his 19th year published a small work on Sweden. In 1830 he became the associate of Lamennais and Lacordaire in founding and editing *L'Avenir*, went with them to Rome to plead their own cause in 1831, and on his return opened, with Lacordaire and De Caux, a free Catholic school in Paris, which was closed by the police. The directors were arraigned before an inferior court for infringing the ordinances on public instruction; but Montalembert, having meanwhile become a member of

the chamber of peers, transferred his case to that court, and delivered there in his own defence his first public speech. The papal censure which fell upon Lamennais a few years later strengthened Montalembert's attachment to the church, without shaking his liberal convictions. He devoted himself to the study of the middle ages, and published *Histoire de Saint Elizabeth de Hongrie* (Paris, 1836; English translation by Mary Hackett and Mrs. J. Sadlier, New York, 1854), and an essay *Du Vandalisme et du Catholicisme dans l'art* (1839). He spoke frequently in the chamber of peers. In 1842 he opposed M. Villemain's bill for the organization of secondary schools, protesting against the "university monopoly" which placed all the schools under the control of the faculty of laymen. In 1843 he published his *Manifeste catholique*. He was now the recognized leader of the Catholic party. He delivered three elaborate addresses on the freedom of the church, of education, and of religious orders, in the last of which he eulogized the Jesuits; and in 1847 he founded a religious society to uphold the cause of the Swiss Sonderbund. He spoke in favor of Poland in 1831, 1844, and 1846. Early in 1848, in a speech on radicalism, he predicted a revolution in the course of three months. When it broke out he joined the democratic party, published an address avowing republican sentiments, and was elected by the department of Doubs as a deputy in the constituent assembly. Here, however, he acted rather with the conservative party than with the thorough democrats. He opposed the admission of Louis Napoleon, and voted against the new constitution; and toward the close of the session he supported Dufaure's bill for the restriction of the press, and approved the expedition sent to Rome to restore the papal authority. Returned to the legislative assembly by the departments of Doubs and Côtes-du-Nord, he became still more conservative, and was one of the committee which drafted the law of May 31, abolishing universal suffrage. In June, 1851, he had a memorable debate with Victor Hugo on the proposed revision of the constitution. After the *coup d'état* of Dec. 2 he protested against the imprisonment of the deputies, and became more determined in his hostility to Napoleon; but he obtained a place on the second consultative committee, and a seat in the legislative body, where he was almost the only representative of the opposition. Having failed to be reelected in 1857, he lived in retirement, employed in literary labors. An article which he published Oct. 25, 1858, entitled *Un débat sur l'Inde au parlement anglais*, led to his prosecution on account of invidious comparisons between the institutions of France and Great Britain. He was sentenced to a fine of 3,000 francs and six months' imprisonment; but both penalties were remitted by the emperor. In 1852 he was elected to the French academy. After his withdrawal from political life, Mon-

talement busied himself chiefly with the preparation of *Les moines d'Occident depuis Saint Benoît jusqu'à Saint Bernard* (5 vols., Paris, 1860-'67; 3d ed., 1868; English ed., Edinburgh, 1861). He took a lively interest in the progress of the civil war in the United States, his last pamphlet, *La victoire du Nord aux États-Unis* (Paris, 1866; English translation, Boston, 1866), being a hymn of triumph over the success of the Union arms. In 1863 he warmly espoused the cause of Poland in the volume entitled *De l'insurrection polonoise*; and in August, at the Catholic congress held in Mechlin, he read a discourse on "A free Church in a free State," which excited angry discussions between the liberal Catholics and ultramontanians. At the approach of the Vatican council he openly declared against defining the doctrine of pontifical infallibility. Besides the works already mentioned, he wrote *Du devoir des Catholiques dans la question de la liberté d'enseignement* (1844); *Saint Anselme, fragment de l'introduction à l'histoire de Saint Bernard* (1844); *Quelques conseils aux Catholiques* (1849); *Des intérêts catholiques aux XIX^e siècle* (1852; English translation, 1853); *L'Avenir politique de l'Angleterre* (1855; English translation, 1856); *Une nation en deuil, la Pologne en 1861* (1861); *Le père Lacordaire* (1862); and *Le Pape et la Pologne* (1864). He was one of the editors of the *Correspondant*. An edition of his complete works has been published by Lecoq (9 vols., Paris, 1861-'8).—See Mrs. Oliphant's "Memoirs of Count de Montalembert" (2 vols., Edinburgh and London, 1872).

MONTALVAN, Juan Perez de, a Spanish dramatist, born in Madrid in 1602, died in June, 1638. His father was bookseller to the king, and the son became a licentiate in theology at the age of 17. He enjoyed the instruction of Lope de Vega, and very early wrote for the stage. At the age of 30 he had written 36 dramas and 12 *autos sacramentales*; and he became crazy from overwork. He left about 60 plays (*Alcala*, 1638; Madrid, 1639). He wrote *Orfeo*, a poem (1624); "Life and Purgatory of St. Patrick" (1627); a collection of stories *Para todos* ("For Everybody," 1632); and a panegyric on Lope de Vega (1636).

MONTANA, a territory of the United States, situated between lat. 44° 15' and 49° N., and lon. 104° and 116° W.; length E. and W. on the N. border, 540 m., and along the 45th parallel 460 m.; average breadth, 275 m.; area, 145,776 sq. m. It is bounded N. by British America, and E. by Dakota, and for a short distance along the 111th meridian by Wyoming. On the south, E. of the 111th meridian, it is bounded by Wyoming (along the 45th parallel); W. of the 111th meridian, it borders S. and S. W. (along the crest of the Rocky and Bitter Root mountains) and then W. on Idaho. The territory is divided into 11 counties, viz.: Beaver Head, Big Horn, Choteau, Dawson, Deer Lodge, Gallatin, Jefferson, Lew-

is and Clarke, Madison, Meagher, and Missoula. The principal cities and towns are Helena (pop. in 1870, 3,106), the capital; Virginia City (867), the former capital; Deer Lodge City (788); and Argenta, Bannack, Bozeman, Diamond City, Fort Benton, Gallatin, Missoula City, and Radersburg. The population in 1870, exclusive of tribal Indians, according to the United States census, was 20,595, of whom 18,306 were whites, 183 colored, 1,949 Chinese, and 157 Indians; 12,616 were native and 7,979 foreign born, 16,771 males and 3,824 females. There were 11,523 citizens of the United States 21 years old and upward; 7,058 families, with an average of 2.92 persons to a family; 9,450 dwellings, with an average of 2.18 persons to a dwelling; 667 persons 10 years old and over unable to read; 918, including 129 Chinese and 78 Indians, unable to write, of whom 394 were natives and 524 foreigners. Of the 14,048 persons 10 years old and over returned as engaged in all occupations, 2,111 were employed in agriculture, 2,674 in professional and personal services, 1,233 in trade and transportation, and 8,030 in manufactures and mining, including 6,720 miners. The tribal Indians of Montana, according to the report of the United States commissioner of Indian affairs for 1874, number 22,486, as follows:

TRIBES.	No.	TRIBES.	No.
Flatheads	471	Santee and Sisseton	
Pend d'Oreilles	1,026	Sioux.....	1,168
Kootenays.....	832	Yanktonais Sioux...	2,246
Mountain Crows.....	3,000	Uncpapa Sioux....	1,420
River Crows.....	1,200	Uncpatina Sioux...	460
Blackfeet.....	1,500	Assiniboins.....	4,698
Bloods.....	1,500	Gros Ventres.....	1,000
Piegans.....	2,450		

The Flatheads, Pend d'Oreilles, and Kootenays have a reservation of 1,433,600 acres in the valley of Joeko river, a tributary of the Flathead, near Flathead lake, but most of the Flatheads have hitherto resided in the valley of the Bitter Root river and refused to remove to the reservation. The Crows have a reservation bounded W. and N. by the Yellowstone river, E. by the 107th meridian, and S. by Wyoming. The other tribes have had assigned to them the region N. of the Marias and Missouri rivers. The Blackfeet never and the Bloods seldom visit their agency, roaming most of the time N. of the British line. Besides those enumerated in the table, there are some roving Sioux not belonging to any agency.—The E. portion of the territory, about three fifths of the whole, consists chiefly of rolling table lands or plains; the W. part is mountainous. The main chain of the Rocky mountains, after forming for a considerable distance the S. W. boundary, suddenly (in lat. 45° 40') bends E. for some distance, and then runs N. about 20° W. to the N. border of the territory. The Bitter Root range, leaving the main chain at the bend, continues in a N. W. direction along the boundary to its intersection with the 116th

meridian. Enclosed by the Bitter Root mountains on the west and the main chain on the east and south is a basin occupying the N. W. portion of the territory and embracing about one fifth of its area, which is divided by mountain spurs and streams into numerous valleys and terraces. S. of this is another basin, about half its area and of similar character, occupying the S. W. extremity of the territory, and walled in by the main chain on the north, west, and south. E. of the Rocky mountains are several minor ranges. The Snow mountains enter the territory from Wyoming for a short distance, causing the Yellowstone river to make a detour in sweeping round their N. flank. N. of the Yellowstone the Belt, Judith, and Highwood mountains form an irregular group of short and broken ranges, around which the Missouri river flows N. before assuming its E. course. N. of the Missouri the plain is interrupted only by the Bear's Paw and Little Rocky mountains. The mountains are generally less rugged and elevated than further S., and some of the valleys are depressed much below the lowest point in the Great Basin. The plains vary in height from 2,010 ft. at the mouth of the Yellowstone to 4,091 ft. at the foot of the mountains. The mountain valleys vary in elevation from less than 3,000 to about 5,000 ft., while the peaks rise above the line of perpetual snow. The N. W. basin is drained by tributaries of the Columbia river; the rest of the territory by the Missouri and its tributaries. Clarke's fork of the Columbia, formed near the centre of the basin by the junction of the Flathead and Bitter Root rivers, flows N. W. into Idaho, and is navigable for some distance in Montana by small steamers. The Flathead rises in British America and has a general S. course near the foot of the Rocky mountains, expanding near the 48th parallel into a lake of the same name (the only one in the territory), about 30 m. long and 10 or 12 m. wide. The Bitter Root rises in the S. W. corner of the basin, and has a N. course, receiving the Hell Gate river, which rises in the S. E. extremity of the basin. The latter is formed by the junction of the Deer Lodge and Little Blackfoot rivers, and a short distance before entering the Bitter Root receives the Big Blackfoot from the east. The Bitter Root above the mouth of the Hell Gate is sometimes called the Missoula. The N. W. corner of the territory is intersected by the Kootenay river. The Missouri river is formed near Gallatin in the S. W. part of Montana by the junction of the Jefferson, Madison, and Gallatin rivers, which have a general N. course, and flows N. and N. E., E. of Helena, to Fort Benton, whence it pursues a general E. course to the Dakota line, which it crosses near the 48th parallel. It is navigable to Fort Benton, more than 300 m. from the boundary. Its principal tributaries are Green river and Smith's or Deep river from the east; the Arrow, Judith, and Musselshell, from the south;

and from the west and north, Medicine or Sun river, Teton, Marias, and Milk rivers. Jefferson river is formed by the junction of the Big Hole or Wisdom, Beaver Head, and Stinking Water rivers, which rise in the Rocky mountains in the S. W. extremity of the territory; Madison river, the middle fork, rises in the N. W. corner of Wyoming; E. of this is the Gallatin, rising between the Madison and Yellowstone rivers. The Yellowstone rises in Yellowstone lake in N. W. Wyoming, near the source of Madison river, and flows N. and N. E., draining the S. and E. sections of Montana, and joining the Missouri on the Dakota border. It is navigable in spring and early summer by large steamers 300 or 400 m. above its mouth. Its chief tributaries are the Big Rosebud river, Clarke's fork, Pryor's river, the Big Horn, Rosebud, Tongue, and Powder rivers from the south, and Porcupine river from the north. The Little Missouri river crosses the S. E. corner of the territory from Wyoming, and joins the Missouri in Dakota.—The prevailing geological formation in the east, as far as the 107th meridian on the southern boundary and the 109th on the north, is the lignite tertiary. W. of this is a cretaceous region, having its widest expanse at the north. W. and S. W. of the cretaceous are narrow belts stretching across the territory along the foot of the Rocky mountains, composed of red beds, Jurassic and carboniferous rocks, and Potsdam sandstone. The Rocky mountain range and the two basins are largely of igneous origin, consisting of basalt, granite, and various metamorphic rocks. Limestone, slate, and granite suitable for building purposes, and sands and clays adapted to brickmaking, are abundant. Bituminous coal has been found near Bannack, Helena, Virginia City, and Deer Lodge City, on the head waters of the Big Blackfoot, and in several places on the Musselshell, Yellowstone, and Missouri rivers. Lignite exists in great quantities on the Missouri and Yellowstone in the E. part of the territory, and on the head waters of the Teton and Marias rivers. Hot springs and geysers are numerous about the head waters of the Missouri and Yellowstone. (See GEYSER.) The precious metals, found in the metamorphic rocks, are abundant, Montana having been second only to California in the production of gold. The placer diggings are chiefly on the tributaries of the Hell Gate, Big Blackfoot, Madison, and Jefferson rivers, on the Missouri and its tributaries from the junction of the three forks to the mouth of Smith's river, and on the bars of the upper Yellowstone. The principal quartz mines are near Argenta, Bannack, Helena, Highland in Deer Lodge co., and Virginia City. Much attention is now given to silver and copper. These metals exist in conjunction with each other and with gold, and sometimes separately. Silver is chiefly found on Flint and Silver Bow creeks, affluents of Hell Gate river; Alder and Ram's Horn gulches

of Stinking Water river; Ten Mile creek, near Helena; and on Rattlesnake creek, a tributary of Beaver Head river. Copper predominates on Beaver creek, near Jefferson City, Jefferson co.; on a branch of Silver Bow creek, near Butte City, Deer Lodge co.; and at the source of Musselshell river. Gold was first discovered, on Gold creek, a branch of the Hell Gate, in 1852, but no mining took place until the autumn of 1861. The first quartz mill was erected in the beginning of 1863. According to the returns of the United States census of 1870, which are admitted to be imperfect, the number of gold mines was 683; hands employed, 3,534; capital invested, \$2,518,613; wages paid, \$1,381,699; value of materials used, \$735,901; of product, \$4,030,435; 67, product \$737,458, were hydraulic mines; 607, product \$3,053,373, placer; and 12, product \$234,604, quartz. The bullion product of Montana, following J. Ross Browne's "Resources of the Pacific Slope," for the period prior to and including 1867, and the estimate of R. W. Raymond, United States commissioner of mining statistics, for the subsequent years, has been as follows:

YEAR.	Product.	YEAR.	Product.	YEAR.	Product.
1862..	\$500,000	1867..	\$12,000,000	1872..	\$6,078,389
1863..	8,000,000	1868..	15,000,000	1873..	5,178,047
1864..	13,000,000	1869..	9,000,000	1874..	4,000,000
1865..	14,500,000	1870..	9,100,000		
1866..	16,500,000	1871..	8,050,000	Total.	\$120,901,386

Of the product in 1872, \$351,944, and in 1873 \$176,500, was silver. The deposits of gold from the territory at the United States mints and assay offices, to June 30, 1874, amounted to \$36,640,618 66; of silver, to \$304,361 51. —The climate is healthy. Little rain falls, and in most parts of the territory irrigation is necessary. Much snow falls on the mountains, particularly in the N. W. basin. The average temperature is higher than in the same latitude further east. In the valleys, especially in the south, little snow falls, and cattle winter without shelter, while from the dryness of the atmosphere the cold of greater altitudes is less severely felt. The average temperature at Fort Benton (lat. 47° 52', lon. 110° 40', elevation 2,674 ft.) of the year ending Sept. 30, 1873, was 41·97°; total rainfall, 12·17 inches. The average temperature of the warmest month (July) was 69·8°; of the coldest (December), 11·3°. The average temperature during 1872 at Virginia City in the S. basin (lat.° 45 19', elevation 5,826 ft.) was 39·25°; warmest month (August), 61·3°; coldest month (December), 18·8°; total rainfall, 9·72 inches. At Deer Lodge City in the N. W. basin (lat. 46° 26', elevation 4,768 ft.) the average temperature for two years was found to be 42°; warmest month, 69·7°; coldest month, —1·5°. The total precipitation of rain and melted snow in 1870 was 16·5 inches. Fort Owen (elevation 3,284 ft.), 65 m. W. by N. of Deer

Lodge City, has an average annual temperature of 47°. The variations are great, the thermometer in winter, except in the lower and more sheltered valleys, sometimes falling to 30° below zero, and rising in summer above 90°. The plains E. of the mountains are generally treeless, and (particularly in the eastern part) possess indifferent facilities for irrigation. Along the streams there is generally a growth of cottonwood, willow, alder, aspen, and similar trees, while the mountain slopes are wooded with pine, fir, spruce, cedar, and hemlock. Timber is more abundant in the N. W. basin than elsewhere, and particularly about the Kootenay river and the upper course of the Flathead. The valleys and terraces afford excellent grazing. The soil of the valleys is fertile, and they are for the most part easily irrigated. Some of the principal agricultural localities are the Deer Lodge, Bitter Root, Blackfoot, Flathead, and Hell Gate valleys, the upper valleys of the Jefferson, Madison, and Gallatin rivers, the valley of the Missouri from the junction of the three forks to the mouth of Sun river, and a tract about 30 m. wide along the E. base of the Rocky mountains, stretching from Sun river to the international boundary, which is watered by numerous small tributaries of the Marias, Teton, and Sun. Currants, strawberries, raspberries, and gooseberries grow wild. The principal cultivated crops are wheat, rye, barley, oats, and potatoes. Some varieties of Indian corn may be grown in portions of the territory, but the climate is generally too cold. Beans, peas, turnips, beets, carrots, onions, cabbage, squashes, melons, tomatoes, cucumbers, and the hardier fruits thrive. Grain yields abundantly. Among wild animals are the buffalo, on the plains in the east, the grizzly bear, and the antelope.—According to the census of 1870, the number of farms was 851, containing 84,674 acres of improved land; cash value of farms, \$729,193; of farming implements and machinery, \$145,438; wages paid during the year, including the value of board, \$325,213; estimated value of all farm productions, including betterments and additions to stock, \$1,676,660; value of produce of market gardens, \$35,130; of forest products, \$918; of home manufactures, \$155,357; of animals slaughtered or sold for slaughter, \$169,092; of live stock, \$1,818,693. The productions were 177,535 bushels of spring wheat, 3,649 of winter wheat, 1,141 of rye, 320 of Indian corn, 149,367 of oats, 85,756 of barley, 988 of buckwheat, 2,414 of peas and beans, 91,477 of Irish potatoes, 31 of grass seed, 600 lbs. of tobacco, 100 of wool, 408,080 of butter, 25,603 of cheese, 105,186 gallons of milk sold, and 18,727 tons of hay. The live stock consisted of 5,289 horses, 475 mules and asses, 12,432 milch cows, 1,761 working oxen, 22,545 other cattle, 2,024 sheep, and 2,599 swine. There were besides 1,444 horses and 45,642 cattle not on farms. The number of horses

assessed in 1873 was 19,905; cattle, 104,777; mules, 1,606; sheep, 10,597. The whole number of manufacturing establishments in 1870, according to the census, was 201, having 33 steam engines of 822 horse power, and 46 water wheels of 795 horse power; hands employed, 701; capital invested, \$1,794,300; wages paid, \$370,843; value of materials used, \$1,316,331; of products, \$2,494,511. The most important establishments were 34 quartz mills, capital \$1,184,900, value of products \$801,873; 8 flour and grist mills, 31 saw mills, 13 breweries, and 6 manufactories of jewelry. The number of quartz mills, including those not in operation, according to the report of the United States commissioner of mining statistics for 1870, was 48, having 591 stamps and 62 arrastras, and mostly run by steam. One, in Deer Lodge co., was for the production of silver; the rest, of gold.—There are no railroads in Montana, but the Northern Pacific is to cross the territory from E. to W. The principal towns have telegraphic communication with the east and the Pacific coast. There are five national banks, with an aggregate capital of \$350,000.—The government is similar to that of the other territories. The executive officers are a governor and secretary, appointed by the president with the consent of the senate for four years, and a treasurer, auditor, and superintendent of public instruction, created by local law. The legislative power is vested in a council of 13 and an assembly of 26 members, elected by the people for two years. Judicial authority is exercised by a supreme court, district courts, probate courts, and justices of the peace. The supreme court consists of three justices, appointed by the president with the consent of the senate for four years, and has appellate jurisdiction. A district court with general original jurisdiction is held by a justice of the supreme court in each of the three judicial districts. There is a probate court for each county, with the usual powers of such courts. Justices of the peace have cognizance of inferior cases. According to the United States census of 1870, the assessed value of real estate was \$2,728,128; of personal property, \$7,215,283; true value of both, \$15,184,522. The total taxation not national was \$198,527, of which \$38,131 was territorial, \$157,396 county, and \$3,000 town, city, &c.; county debt, \$276,219; town, city, &c., \$2,500. The valuation for purposes of taxation in 1873 was \$9,803,745; taxation for territorial purposes, \$39,214 98. The receipts into the territorial treasury for the year ending Dec. 1, 1873, including \$643 64 on hand at the beginning of the period, were \$66,517 73; disbursements, \$65,792 15; balance, \$725 58. The net territorial debt on Dec. 31, 1873, amounted to \$128,762 47, a decrease during the year of \$13,786 52; \$92,283 44 of this amount was in bonds bearing 12 per cent. interest. The aggregate debt of the several counties on March 1, 1873 (Lewis and Clarke

to Sept. 1), was reported as \$432,987 74. The territorial penitentiary is at Deer Lodge City. According to the report of the superintendent of public instruction for 1873, the number of children of school age (4 to 21 years) was 3,517; number attending public schools, 1,881; average attendance, 940; number of organized school districts, 91; of schools taught during the year, 90; teachers employed, 99 (50 males and 49 females); average pay per month, \$68 41; average length of schools, 82½ days; number of school houses, 51; amount raised for schools by county tax, \$31,350 42; by district tax (in Madison co.), \$934 55; amount apportioned during the year from all sources, \$33,161 50; private schools taught during the year, 11, attended by 149 pupils. There are graded schools in Deer Lodge City, Helena, and Virginia City. The number of schools of all classes reported by the census of 1870 was 54 (45 ungraded common, 1 classical academy, 7 day and boarding, and 1 parochial and charity), having 34 male and 31 female teachers, 1,027 male and 718 female pupils, and an income from all sources of \$41,170. There were 141 libraries, containing 19,700 volumes, of which 128 with 14,690 volumes were private; and 10 newspapers (3 daily, 1 tri-weekly, and 6 weekly), issuing 2,860,600 copies annually, and having a circulation of 19,580. The number of church organizations was 15 (1 Christian, 2 Episcopal, 7 Methodist, and 5 Roman Catholic), having 11 edifices, with 3,850 sittings, and property valued at \$99,300.—Montana was set off from Idaho and given a territorial government by the act of May 26, 1864. Its settlement dates from the opening of the gold mines. By the act of Feb. 17, 1873, a tract of about 2,000 sq. m., between lat. 44° 30' on the north, Wyoming on the east, and the Rocky mountains on the south and west, previously belonging to Dakota, was annexed to Montana. Helena became the capital in 1875.

MONTANELLI, Giuseppe, an Italian revolutionist, born at Fucecchio, Tuscany, in 1813, died June 17, 1862. He graduated in law at the university of Pisa in 1831, and became professor of commercial jurisprudence there in 1840. In 1844 he founded a secret political association, and in 1847 a liberal journal, *L'Italia*. He was severely wounded and captured by the Austrians in the battle of Curtatone, May 29, 1848. He afterward became prime minister of Tuscany, and after the flight of the grand duke in February, 1849, was one of the triumvirs. Guerrazzi soon after becoming dictator, he sent Montanelli as ambassador to Paris, where he remained ten years, being meantime sentenced to imprisonment for life by the restored grand ducal government. In 1859 he founded a journal at Florence, and subsequently became a member of the Italian parliament. He wrote "Memoirs" of the movements in Italy (Turin, 1853-'5; translated into French, 2 vols., Paris, 1857), some lyric poems, and for Mme. Ristori, while she

was acting in Paris, the tragedy *Camma* and a translation of Legouvé's *Médée*.

MONTANISTS, a sect of the 2d century, so called after Montanus of Phrygia. He is said to have been a priest of Cybele, and to have announced himself about 160 as a prophet, who was to carry Christianity forward to perfection. He taught a permanent extraordinary influence of the Paraclete, manifesting itself by prophetic ecstasies and visions, assigned to doctrines and rites a subordinate significance, and demanded the most rigid asceticism as a manifestation of internal purity. Besides the ordinary fasts, he prescribed annual and weekly ones, and declared second marriages and flight from persecution to be sins. He represented the beginning of the millennium as very near at hand, and Pepuza in Phrygia as the place which would be its centre. His followers, who were also called Cataphryges and Pepuziani, found a zealous and gifted advocate in Tertullian, and included many prophetesses, among whom Maximilla and Priscilla are especially celebrated. The members of the ruling church were designated by them as *psychii*, while they assumed themselves the name *pneumatii*. They were opposed especially by the Alexandrian school, and condemned by several provincial councils. They were numerous in Mysia, Lydia, and Phrygia, where some towns, as Pepuza and Thyatira, were exclusively inhabited by them. Thence they spread into other parts of Asia Minor, especially into Capadocia, Galatia, and Cilicia. In Constantinople and Carthage also they were very numerous. The literature of the modern Tübingen school represents Montanism as a reaction of Jewish Christianity against Paulinism.—See Wernsdorf, *De Montanistis* (Dantzic, 1751; strongly favorable); Münter, *Effata et Oracula Montanistarum* (Copenhagen, 1829); Kirchner, *De Montanistis* (Jena, 1832); Schwegler, *Der Montanismus und die christliche Kirche des zweiten Jahrhunderts* (Tübingen, 1841); and Baur, *Das Christenthum und die christliche Kirche der drei ersten Jahrhunderte* (2d ed., 1860).

MONTANUS. See MONTANISTS.

MONTANUS, Arias. See ARIAS MONTANUS.

MONTARGIS, a town of France, in the department of Loiret, on the left bank of the Loing, and at the junction of the canals of Briare, Orleans, and the Loing, connecting the navigation of the Seine and the Loire, 62 m. S. by E. of Paris, and 40 m. E. by N. of Orleans; pop. in 1866, 7,757. The town is well built on a plain which extends from the river to the neighboring forest of Montargis; and it has an active trade, chiefly in grain, wax, honey, and agricultural products. It has also considerable manufactories of cotton goods, cutlery, paper, &c. The most interesting building is the ruin of the once extensive castle of Montargis, on a hill near the town. This was built by Charles V. (1364-'80), and was very strongly fortified, with accommodations for an unusually large garrison. The great hall of the castle (55 by

184 ft.) was elaborately decorated. Among its ornaments was a carving of the combat of a dog and an accused murderer, which tradition represents as having taken place at Paris in 1371, in accordance with the custom of the ordeal of battle then in vogue. The dog having overcome in the combat the alleged murderer of his master, the criminal confessed his crime and was executed. From the carving, this story became universally known as that of the "dog of Montargis."

MONTAUBAN (Lat. *Mons Albanus*), a town of Guienne, France, capital of the department of Tarn-et-Garonne, on the river Tarn, 343 m. S. S. W. of Paris; pop. in 1872, 25,624. It stands on a high plateau, and has wide clean streets and a thrifty appearance. It contains a fine cathedral of the 18th century, and there is a stone bridge over the Garonne which dates from the 14th. There is a lyceum, a normal school, a Protestant faculty of theology, a public library, and a gallery of paintings which includes many by Ingres, a native of the place. The manufactures are extensive, embracing silks, woollens, porcelain, starch, candles, pens, and pharmaceutical products; and there is a large trade in leather, grain, and wine, the surrounding country being very productive. Montauban was founded by Alphonse, count of Toulouse, in 1144, and was made the seat of a bishop in 1317. It became a Protestant stronghold in the 16th century, and its inhabitants were subjected to severe persecution. In 1621 it was besieged by the royal army under De Luynes, which at the end of three months, after numerous assaults, was obliged to withdraw. In 1629 it submitted to the royal authority, and its defences were razed. Subsequently it suffered from the dragonnades.

MONTBELIARD, or **Monbéliard** (Ger. *Mömpelgard*), a town of Franche-Comté, France, in the department of Doubs, at the confluence of the Allan and the Lusine, on the Rhône and Rhine canal, 43 m. N. E. of Besançon; pop. in 1866, 6,479, most of whom are Lutherans. It has a chamber of industry and agriculture, a Protestant normal school, a communal college, a library of 9,000 volumes, and other educational and benevolent institutions. The principal manufactures are woolen and linen fabrics and muslins. It was formerly the capital of a county in Burgundy, which after the extinction of the male line of counts in 1395 passed by marriage to the house of Würtemberg, though at the same time it was under the suzerainty of France; and it was wholly ceded to France in 1801.

MONT BLANC (Fr., "White mountain," so called from the snow which covers it), the highest of the Alps, and with the exception of Mt. Elburz in the Caucasus the highest mountain in Europe, on the confines of Savoy, France, and Piedmont, Italy, in lat. 45° 50' N., lon. 6° 52' E. It extends about 13 m. from N. E. to S. W., with a breadth of 5 to 6 m. Its highest elevation, a narrow pinnacle, is 15,732

ft. above the sea (according to Bruguière, 15,781 ft. according to Corabœuf), and its summit for a distance of 7,000 ft. down is clothed with perpetual snow. The higher parts of Mont Blanc are composed of primitive rock,

and its outlying flanks consist of calcareous strata turned up against the great central mass. The sides, to the height of 3,000 to 4,000 ft. above Chamouni, are skirted with forests. The surface of its higher parts is diversified and very



Mont Blanc from above Morges.

irregular; there are numerous jutting rocks, called *aiguilles* or needles; large fields of ice, often broken into fissures of unknown depth; and grottoes excavated beneath the masses of ice by the warmer temperature below, and hanging with splendid stalactitic formations. Glaciers frequently sweep down its sides. At night the summit shines with a faint light, which is thus accounted for: there is high in the atmosphere a zone of thin vapor which is still lighted by the sun after Mont Blanc has ceased to be within range of its rays, and this vapor reflects a part of the light which it receives upon the summit of the mountain. The first ascent of Mont Blanc was made with great danger and difficulty by Dr. Paccard and Jacques Balmat in August, 1786; but during the preceding ten years several unsuccessful attempts had been made. They found the cold so excessive that they remained on the summit only half an hour. The next year De Saussure accomplished the ascent, and made a variety of scientific observations. Albert Smith's ascent in 1851 and subsequent pictorial and dramatic descriptive entertainment, and his "Story of Mont Blanc" (London, 1854), gave unusual popularity to the subject in England for several years. A record of two ascents (1858-'9) by Prof. Tyndall is in "The Glaciers of the Alps" (London, 1860). In 1855 Prof. J. D. Forbes published a "Tour of Mont Blanc and Monte Rosa," and subsequently a series of papers on the theory, measurement, and move-

ment of the glaciers. There are also numerous recent accounts of ascensions by members of the English Alpine club. The achievement is no longer considered either dangerous or difficult. The guides and all matters relating to them are regulated by the French government, and ascents are frequent.

MONTBRISON, a town of France, in the department of Loire, on the Vizezy, an affluent of the Loire, 37 m. S. W. of Lyons; pop. in 1866, 6,475. The most notable building is the principal church, Notre Dame de l'Espérance, built from 1223 to 1466. Its industry and trade are of no great importance. It was formerly the capital of the department.

MONTCALM, a S. central county of the S. peninsula of Michigan, watered by tributaries of the Muskegon, Chippewa, and Grand rivers; area, 720 sq. m.; pop. in 1870, 13,629. It has an undulating surface and a fertile soil. The Detroit, Lansing, and Lake Michigan railroad and the Stanton branch traverse it. The chief productions in 1870 were 136,778 bushels of wheat, 117,163 of Indian corn, 63,925 of oats, 178,010 of potatoes, 49,541 lbs. of wool, 50,755 of maple sugar, 43,346 of butter, and 13,141 tons of hay. There were 1,827 horses, 2,256 milch cows, 2,996 other cattle, 13,485 sheep, and 3,346 swine; 3 manufactories of boots and shoes, 4 of carriages and wagons, 3 of saddlery and harness, 4 of sash, doors, and blinds, 2 flour mills, and 49 saw mills. Capital, Stanton.

MONTREAL, a S.W. county of Quebec, Canada, N. of the St. Lawrence river; area, 4,027 sq. m.; pop. in 1871, 12,742, of whom 10,794 were of French and 1,557 of Irish origin and descent. It is watered by the Gatineau, Du Lièvre, Rouge, North, and Lac Ouareau rivers, and other streams. Capital, Ste. Julienne.

MONTREAL DE CANDIAC. See CANDIAC.

MONTREAL DE SAINT-VÉLAN, Louis Joseph, marquis de, a French soldier, born at the château of Candi, near Nîmes, Feb. 28, 1712, died in Quebec, Sept. 14, 1759. He entered the army when 14 years old, served in Italy in 1734, distinguished himself in Germany under Belle-Isle during the war for the Austrian succession, and fought in Italy again, where he gained the rank of colonel in the disastrous battle of Piacenza (1746). In 1756 he was appointed to command the French troops in Canada, where he arrived about the middle of May. He captured Fort Ontario at Oswego on Aug. 14 and the next year forced Fort William Henry, at the head of Lake George, with a garrison of 2,500 men, to surrender at discretion, and thus became possessed of 42 guns and large stores of ammunition and provisions. Montcalm had suffered from scarcity of provisions, and was opposed to an enemy far superior in numbers and discipline to his own troops, which consisted mostly of Canadian volunteers; yet he held his ground firmly, when, in the campaign of 1758, the English under Abercrombie marched from the south toward the French dominions. Montcalm occupied the strong position of Fort Carillon (Ticonderoga), made it still stronger by intrenchments, and at the head of about 3,600 men awaited the attack of 15,000. After a fierce battle which lasted four hours (July 8, 1758), the British retreated in disorder. The personal bravery of Montcalm increased his popularity among his soldiers; and if he had received timely reinforcements, he could have maintained the supremacy of the French in North America. But the want of energy on the part of the home government, the scarcity of food all over New France, and personal dissensions between the governor and the military commander, forbade him to look for much assistance; and in the midst of victory he expressed his conviction that in a few months the English would be masters of the French colonies in America. Resolved, as he said, "to find his grave under the ruins of the colony," he actively prepared for the campaign of 1759. The English spared no exertions to make their conquest sure; troops were sent from Europe; the colonial regiments were thoroughly reorganized; and a strong fleet coöperated with the land forces. While Amherst and Prideaux were manœuvring to dislodge the French from the vicinity of Lake George and Lake Ontario, Gen. Wolfe, at the head of 8,000 chosen troops, supported by the fleet in the St. Lawrence, appeared before Quebec. The conquest of Canada depended upon the taking of that city; and to protect it Montcalm had con-

centrated his principal forces on the banks of the Montmorency. Being attacked in front by Wolfe, July 31, he repelled him with considerable loss. Wolfe then changed his plans; he secretly landed his troops by night on the left bank of the St. Lawrence, above Quebec, climbed the table land that overhangs the city, and on the morning of Sept. 13 appeared with his whole force on the heights of Abraham, in the rear of the French army. By 10 o'clock the two armies, about equal in numbers, each having fewer than 5,000 men, were drawn up before each other. Montcalm led the attack in person, but his troops soon broke before the deadly fire of the British; and when Wolfe, at the head of the 28th and the Louisbourg grenadiers, gave the order to charge with bayonets, they fled in every direction. Wolfe fell in the moment of triumph; Montcalm had received a musket ball earlier in the action, and was mortally wounded while attempting to rally a body of fugitive Canadians a few moments after Wolfe was borne from the field. On being told that his death was near: "So much the better," he said; "I shall not live to see the surrender of Quebec." He died the next morning, and the French lost all Canada.

MONT DE MARSAN, a town of Gascony, France, capital of the department of Landes, 62 m. S. of Bordeaux, at the junction of the Douze and Midou, which here form the navigable Midouze; pop. in 1866, 8,455. It has a communal college, warm mineral springs, and manufactories of coarse woollen cloths, blankets, and sail cloth.

MONT DE PIÉTÉ, a public institution in continental Europe, the original object of which was to deliver the needy from the charges of Jewish and Lombard money lenders. One is said to have been founded at Freising in Bavaria about the year 1200 by a charitable association and with the sanction of Pope Innocent III.; but it is more generally believed that the first mont de piété was established in Perugia in the latter half of the 15th century, and derived its name (*monte di pietà*) from the hill upon which it was situated. The earliest one in France was probably that of Rheims. Marseilles, Montpellier, and other French cities possessed monts de piété in the 17th century; as in Italy, they were supported by charitable endowments, but they charged interest at the rate of 15 per cent. upon all loans exceeding five francs, whereas the Italian institutions only charged a small rate, rarely exceeding 5 per cent., to cover the indispensable expenses. The mont de piété of Paris was opened Jan. 1, 1778, and was authorized in 1779 to make a loan guaranteed by the income of the *hôpital général*. During the revolution it was closed; and the usurious rates of interest charged by the money lenders during the reign of terror caused its reopening in 1803 to be hailed with delight by the poor. In 1831 it was placed under the charge of an administrative council; and in 1851 the monts de piété were placed

under the superintendence of a select committee. The Paris mont de piété is situated in the rue des Blancs Manteaux, with two large branches in the rue Bonaparte and the rue de la Roquette. There are also about 20 agents scattered over Paris, appointed by the administration. The mont de piété makes advances from three francs upward at a rate fixed in 1854 at $4\frac{1}{2}$ per cent. per annum, which has since been as high as 9 per cent. In 1873 the rate was 5 per cent. No money is advanced except upon securities, the value of which is assessed by a committee of appraisers, four fifths of the value being advanced upon articles of gold and silver, and two thirds upon all other articles. A receipt for the article pledged is given to the owner, who must prove his identity in order to reclaim it. The articles pledged, if not redeemed, are sold at public sales at the expiration of 14 months, and the surplus money, if any, is paid to the owner of the article if applied for within three years. The annual receipts and expenditures of the mont de piété are respectively about 50,000,000 francs, with a balance of about 230,000 francs in favor of the institution. The most profitable customers of the mont de piété are not the poor, but the needy of the higher classes. During the rule of the commune in Paris in 1871, the official organ published a decree, May 12, that all articles of wearing apparel, linen, books, bedding, and working tools, pledged at the mont de piété for a sum not exceeding 20 francs, could be taken out without any payment, the receiver of money on such articles proving his identity; and it was estimated that the sum to repay such advances would be about 8,000,000 francs. The largest number of applications for redemption is on Saturdays, and just before New Year's and Easter. In 1873 there were 46 monts de piété in France, with a capital of about 50,000,000 francs, making yearly loans of about 60,000,000. In five of the establishments the loans are gratuitous; in the rest the rate of interest varies. There are numerous similar establishments in Holland, Belgium, and Germany. In the latter country the rate of interest varies from 8 to 12 per cent.; loans rarely exceed the amount of \$150, and the smallest pledge must be worth at least \$2, one month being the shortest and a year the longest term of the loan. The rate of interest in the Russian monts de piété is 6 per cent. China is said to possess very ancient institutions of the kind, under the direction of great public dignitaries, which seem to be conducted upon more charitable principles than those of Europe, the rate of interest there being only from 2 to 3 per cent.—These institutions are represented in Great Britain and America by pawn shops, which differ from them in being private establishments regulated by special laws.

MONTEBELLO, a small village of Italy, on the road from Alessandria and Voghera to Piacenza; about 4 m. E. of Voghera. It was the scene of a victory of the French under Lannes

over the imperialists, June 9, 1800, five days before the battle of Marengo, and of an engagement between the French and Sardinian allies and the Austrians, May 20, 1859, in which, with a loss of about 650, the allies defeated the Austrians, who lost about 1,000 killed and wounded and 200 prisoners.

MONTE CASINO. See CASINO.

MONTECUCULI, or *Montecuccoli*, **Raimondo**, count, an Austrian general, born near Modena in 1608, died in Linz, Oct. 16, 1681. He entered the Austrian army in 1627, and distinguished himself in the thirty years' war. On Sept. 7, 1631, he was wounded and taken prisoner in the battle of Breitenfeld, and liberated in 1632. For his gallantry in the assault on Kaiserslautern, in July, 1635, he was promoted to a colonelcy. In 1639, while attempting to prevent the Swedes from crossing the Elbe at Melnik, in Bohemia, he was worsted and taken prisoner. On his release two years afterward he joined the imperial army in Silesia, defeated the enemy at Troppau, and took the town of Brieg. On the outbreak of war in Italy he went thither, and received from the duke of Modena the title of brigadier general and the command of his cavalry; but he soon returned to Austria, was appointed in 1644 lieutenant field marshal and a member of the aulic council of war, supported in 1645 the archduke Leopold in his expedition against Rákóczy of Transylvania, and was sent to oppose Turenne on the Rhine. The next year, in conjunction with Johann von Werth, he completely routed the Swedes in Silesia, and received the rank of general of cavalry. Being in 1657 placed in command of the army sent by the emperor to protect John Casimir of Poland against the Transylvanians and the Swedes, he forced Rákóczy to make peace. Promoted to the rank of field marshal, he was sent the next year to relieve Denmark, rescued Copenhagen from the attacks of the Swedes, and expelled them from Jutland and the island of Fünen. After the establishment of peace in the north by the treaty of Oliva (1660), he commanded the army sent against the Turks, whom he drove from Transylvania, and on Aug. 1, 1664, gained on the banks of the Raab the victory of St. Gotthard, which for the time delivered Christian Europe from Turkish invasion. When in 1672 Louis XIV. threatened Holland, Montecuculi commanded the imperial army which took the field in behalf of the Dutch, and baffled the plans of Turenne, whom he worsted on several occasions. For a while superseded in the command by the elector of Brandenburg, he was soon recalled (1675), as the only general who could hold his ground in presence of the great French marshal. On the death of Turenne he drove the French army across the Rhine, and invaded Alsace; but his progress was stopped by the prince of Condé, who obliged him to raise the siege of Hagenau and recross the Rhine. After this campaign Montecuculi returned to Vienna and devoted his time to sci-

ence, art, and literature. The dignity of a prince of the German empire was conferred on him by the emperor Leopold in 1679, and soon afterward the king of Naples gave him the duchy of Melfi. He lost his life by the fall of a beam. He left a personal memoir (translated into Latin under the title of *Commentarii Bellici*, fol., Vienna, 1718), containing disquisitions on the military art and an account of his campaigns against the Turks. His writings were published in the original Italian by Ugo Foscolo (2 vols. fol., Milan, 1807-8), and by J. Grassi (2 vols. 4to and 8vo, Turin, 1821).

MONTEFIORE, Sir **Moses**, a Jewish philanthropist, born in London, Oct. 24, 1784. His ancestors had been wealthy bankers in London for several generations. He married, June 10, 1812, Miss Judith Cohen, a sister-in-law of Nathan Meyer Rothschild, the founder of the London branch of that house. While visiting Palestine in 1829 with his wife, he became interested in his coreligionists there. In 1837 he became sheriff of London and was knighted on the queen's visit to the city, and in 1846 he was made a baronet. He made a second journey with his wife to the East in 1840, in company with Crémieux, on occasion of the persecution of the Jews in Damascus, and visited Palestine on several other occasions, always in the interest and for the relief of the Jews. In 1846 he prevailed upon the emperor Nicholas to suspend a ukase against the Jews, and was invited to visit Poland to suggest measures for the amelioration of the condition of its Jewish inhabitants. In 1854 he collected funds for the relief of the sufferers by the famine in the East, obtained from the sultan the privilege of holding real estate, and established poorhouses in Jerusalem, and also promoted industry and agriculture. In 1863, having secured at Madrid the coöperation of Queen Isabella, he obtained a firman from the sultan of Morocco in favor of the persecuted Jews, guaranteeing their equal protection with Christians. In 1866, in his 82d year, he made his last visit to his protégés in Palestine, who had been afflicted by the cholera, and whose crops had been destroyed by locusts. In the following year he went to Bucharest to use his influence against the ill treatment of the Jews in Roumania. In 1867 he endowed a Jewish college at Ramsgate in honor of his wife, who had died childless, Sept. 24, 1862. The freedom of the city of London was tendered to him in 1873, with a valuable present, in token of his benevolence. Lady Montefiore published, "Notes of a Private Journal of a Visit to Egypt and Palestine" (London, 1844).

MONTÉGUT, **Émile**, a French author, born in Limoges, June 24, 1826. He studied in Paris, and became known as a contributor to the *Revue des Deux Mondes*, with which he was connected for many years. He was the first to familiarize the French with the writings of Emerson, some of whose essays he translated (1850). He also translated Macaulay's "History

of England" (2 vols., 1853 *et seq.*), and Shakespeare's complete works (1868-'70). Among his most recent writings are *Les Pays-Bas, souvenirs de Flandre et de Hollande* (1869), and *Impressions de voyage et d'art, souvenirs en Bourgogne* (1873).

MONTÉLMART, a town of France, in the department of Drôme, 83 m. S. of Lyons; pop. in 1866, 11,100. It has a citadel, six churches, a communal college, manufactories of figured silk, and an extensive trade in wine and fruits. Here the doctrines of Calvin found the first adherents in France. In 1569 the place was unsuccessfully besieged by Coligni.

MONTÉMOLIN, **Count of**. See CARLOS, III.

MONTÉMORELOS. See MORELOS.

MONTEN, **Dietrich**, a German artist, born in Düsseldorf in 1799, died in Munich, Dec. 13, 1843. He studied at the academy of his native city, and under Peter Hess at Munich, became eminent as a painter of battles, and was employed by Cornelius in preparing the battle scenes of one of his most celebrated frescoes. Among his most esteemed works are "The Departure of the Poles from their Fatherland in 1831," "The Death of Max Piccolomini," "The Death of Gustavus Adolphus," and "The Death of Duke Frederick William of Brunswick in the Battle of Quatre-Bras."

MONTENEGRO (Slav. *Tzernagora* or *Tchernagora*, Turk. *Karadagh*, Alb. *Mâl Zëë* or *Mâl Etyë*, Black Mountains), a semi-independent principality in European Turkey, near the Adriatic, bordering on the Turkish provinces of Herzegovina, Bosnia, Albania, and the Dalmatian circle of Cattaro; area, 1,700 sq. m.; pop. about 130,000, chiefly Slavic. Capital, Cetigne. The limestone ridges of the Dinaric Alps traverse the territory, and it has hardly any plains. The principal mountains are from 5,000 to 8,000 ft. high. Most of the streams, among them the Moratcha, flow into the lake of Scutari on the S. E. border. The mulberry, olive, almond, fig, peach, pomegranate, and other fruit trees, and the vine, are cultivated. The chief productions are maize, potatoes, and tobacco. Agriculture is backward, but every piece of land capable of tillage is planted. Fishing is largely carried on. The winters are very cold, but the climate is healthful. The number of villages is between 200 and 300, mostly in hollows and on the slopes of mountains. The men till the land, and the inferior drudgery is performed by the women. The men wear a white or yellow cloth frock, reaching nearly to the knees, secured by a sash, and a red Fez cap and white or red turban. The women wear a frock or pelisse of white cloth, much longer than that of the men, and both sexes wear sandals of untanned ox hide, and carry the *struka* (somewhat like the Scotch plaid) over their shoulders. The imports are cattle and some horses, tobacco, salt, copper, iron, oil, wax candles, wine, brandy, coffee, sugar, arms, glass, sandals, and Fez caps. The exports are smoked mutton, sumach wood

and leaves, salted and dried fish, wax, honey, vegetables, fruits, and some silk. The principal market is Cattaro. The produce is carried thither chiefly by women, and it is only in the eastern regions of the country that they are assisted in their labor by the use of mules and asses. There is no port and no outlet to the shore, and the Montenegrins are dependent on the Austrian government for permission to pass goods to and from the sea. Manufactures are limited to articles of immediate necessity. Taxes levied on each household, together with duties on salt, fish, and dry meat, the monopoly of tobacco, and the land rent of several convents, amounted in 1872 to about \$23,000, to which Russia annually adds about \$20,000 to cover the tribute due to the Porte. The Montenegrins are all of the non-united Greek church, excepting a few Roman Catholics who belong to the Turkish diocese of Scutari, and every village has its church. The head of the church is the *vladika*, or prince-bishop, who till 1852 was also the secular ruler; he is elected from among the monks or unmarried clergy by the national assembly, and may be deposed by it; he has an annual revenue of \$16,000. The number of priests is about 200; they join in war and the other occupations of the people. Priests must be married before they can be consecrated. The convents are those of Cetigne, Ostrog, and St. Stefano. Education is neglected, and many of the priests are unable to read and write; but several schools were established in 1841, and a printing press in Cetigne, which has issued several books. The first political newspaper was established in 1871. Since the separation of the secular from the ecclesiastical power on the accession of Danilo I. in 1852, the government has been a limited monarchy, hereditary in the male line of the family of Petrovitch of Niegosh. The prince is assisted by a senate of 16 members, which also acts as a supreme court. The legislative functions are exercised by the *skupstina*, or national assembly. There is no standing army except the body guard of the prince and a corps of gendarmes, together numbering 1,000 men. The language of Montenegro is a very pure dialect of the Illyrico-Servian branch of the Slavic, not corrupted by admixture with foreign words.—In ancient times Montenegro formed part of Illyricum. The present principality afterward constituted the S. W. corner of the old kingdom of Servia, which in the 14th century extended from the Adriatic to the Black sea. Toward the end of that century Servia became tributary to the Porte. Montenegro, or Zeta as it was then called, secured its independence under the rule of George Balsha, the son-in-law of the last Servian king, and his descendants. The last of the line (eventually known by the name of Tchernoyevitch) married a Venetian lady, and in 1516 abdicated and with his wife retired to Venice, leaving the government in the hands of the bishop, whose successors (since about 1700 all of the house of

Petrovitch) ruled the country as prince-bishops till one of them proclaimed himself secular prince as Danilo I. (1852). Turkey regarded Montenegro as a portion of her empire, and in 1623 the pasha of Scutari invaded the country with a powerful army, but was repulsed with severe losses. At the beginning of the 18th century the Montenegrins sought the protection of Russia against Turkey. The Turks sent several expeditions thither, one of which in 1714, consisting of 120,000 men, defeated the Montenegrins, and carried more than 20,000 of them into captivity. A war with Venice compelled the Turks to withdraw their forces, and successive invasions were repelled, in one of which, in 1796, 30,000 Turks were slain. In 1820 another invasion by the Turks was repulsed with heavy loss, as was still another in 1832. After a border warfare had continued for many years, at the close of 1852 Omer Pasha with a formidable force was sent to subdue the mountaineers. The position of Montenegro was most critical, when peace was restored by the intervention of Austria and the mediation of other powers. Danilo I. displayed much energy in improving the laws and the condition of the country. Fresh collisions with Turkey took place in 1858; and one of Danilo's uncles was detected in treasonable proceedings. On Aug. 12, 1860, Danilo was assassinated, and was succeeded on the throne by his nephew Nikolo Petrovitch-Niegosh. The insurrection which broke out in Herzegovina in 1861, being favored by the Montenegrins, was followed in 1862 by the invasion of Montenegro by Omer Pasha with an army of 30,000. In August the Turks appeared before Cetigne, and Nikolo soon submitted by treaty to the sovereignty of the Porte. New complications arose with Turkey in 1874 on account of murders committed on the Albanian border, and Montenegro declared war in January, 1875, but a compromise was effected toward the end of that month.

MONTEPIN, Xavier Aymon de, a French author, born at Apremont, Haute-Saône, March 18, 1824. He began life as a journalist, and wrote in conjunction with the marquis de Foudras the novels *Les chevaliers du lansquenet* (10 vols., 1847) and *Les vireurs d'autrefois* (4 vols., 1848), to which he added many others equally descriptive of the elegant, demi-monde, and Bohemian life of Paris. He gained great notoriety by the suppression of his licentious *Filles de plâtre* (7 vols., 1855), but continued to produce other voluminous works of a similar character. Among the most recent are *Le bigame*, *Le mari de Marguerite*, *Confessions de Tulla*, *Les drames de l'adultère*, *La comtesse de Nançey* (all in 1873), and *La voyante* (1873-'74). He also assisted the elder Dumas as a playwright.

MONTEREY, a W. county of California, bordering on the Pacific, bounded E. by the Coast range of mountains, intersected by the Salinas or Buenaventura river, and drained also by the San Benito and other streams; area, 4,536 sq. m.; pop. in 1870, 9,876, of whom 230 were

Chinese. The surface is traversed by several ranges. The best land lies in the valleys of the Salinas and San Benito, and the varieties of elevation permit the production of a great diversity of fruits, of which those that reach the greatest perfection are the fig, peach, apricot, grape, apple, pear, and olive. The county is thinly wooded except on the coast. Silver, copper, lead, quicksilver, and granite are among the mineral resources. Stock raising is the principal occupation. The Southern Pacific railroad traverses the county. The chief productions in 1870 were 744,093 bushels of wheat, 21,411 of oats, 681,115 of barley, 131,213 of peas and beans, 69,850 of potatoes, 59,120 lbs. of tobacco, 1,054,310 of wool, 423,385 of butter, 713,550 of cheese, and 18,927 tons of hay. There were 8,017 horses, 9,370 milch cows, 32,266 other cattle, 298,877 sheep, and 13,952 swine; and a number of manufactories. San Benito co. was formed from the E. part in 1874, reducing the area given above. Capital, Monterey, on a bay of the same name, 85 m. S. S. E. of San Francisco; pop. in 1870, 1,112. It was formerly the seat of an important Roman Catholic mission, and was the capital of California till 1847.

MONTEREY, a city of Mexico, capital of the state of Nuevo Leon, on a river of its own name, 450 m. N. N. W. of Mexico; pop. in 1869, 13,584. It is on a rapidly sloping plain about 6 m. from the Sierra Madre, 1,500 ft. above the sea. The streets are regular, well kept, and well lighted; and the houses, chiefly of limestone, are well built and tasteful. The principal square is embellished with a marble fountain by native artisans. Among the more noteworthy edifices are the cathedral, two churches, one of which is among the handsomest in the republic, and the municipal and government palaces. Monterey has also a fine hospital, a prison, barracks, and abattoir, a seminary, two colleges, and 15 public and 20 private schools. The climate is comparatively mild, but subject to sudden changes. Monterey is one of the most prosperous manufacturing towns in Mexico. There are cotton, paper, flour, and saw mills, and manufactories of nails, bricks, carriages, morocco, candles, soap, sugar, beer, and brandy. Modern machines and implements are being rapidly introduced from the United States, whence are also imported large quantities of books and other merchandise.—The city was founded in 1596, on the site of the former Ciudad de Leon, and received the name of Nuestra Señora de Monterey. In 1777 it was made a bishopric. It has frequently been visited by cholera and other epidemics. In the early part of the war between the United States and Mexico, Monterey was a strong military position amply fortified, and held by the Mexican Gen. Ampudia with 10,000 regular troops. On Sept. 19, 1846, Gen. Taylor with 6,600 men attacked it. The city was bombarded in the morning, from batteries erected during the night; then a brigade under Gen.

Quitman carried the lower part of the town by assault, while Gen. W. O. Butler with the first Ohio regiment entered at another point. Gen. Worth carried the heights south of the river and the Saltillo road, and turned the guns upon the bishop's palace; next morning he stormed the height overlooking the palace, and turned its guns upon the flying Mexicans. The main body of the Mexicans retired step by step, taking advantage of the solidly built houses, and the Americans fought their way through the city, reaching the principal plaza on the 23d. Ampudia capitulated on the 24th. The American loss was 120 killed and 368 wounded; the Mexican loss was not ascertained.

MONTESPAN, *Françoise Athénais de Rochechouart de Mortemart*, marquise de, a mistress of Louis XIV. of France, born at the château of Tonny-Charente in 1641, died at Bourbon-l'Archambault in 1707. She was the younger daughter of Rochechouart, first duke of Mortemart, and was educated in the convent of Ste. Marie at Saintes. She was first known as Mlle. Tonny-Charente, and was maid of honor to the duchess of Orleans. At the age of 22 she married Pardaillan de Gondrin, marquis de Montespan, and became lady in attendance to the queen. Her beauty, wit, and conversational powers at once made a sensation; but for several years the king seemed scarcely to notice her. She secretly became his mistress however about 1668, and was openly declared such two years later. Her husband, who attempted to break off the connection, was banished to his estate, and was legally separated from her in 1676. For 14 years her influence over the king was unbounded; she prevailed upon him to legitimate their children, who were confided to the care of the widow Scarron, afterward Mme. de Maintenon, who in time supplanted Mme. de Fontanges, the immediate successor of their mother in the royal affections. She was finally separated from him in 1686, and in 1691 she was obliged to leave Versailles. She retired to a convent, and tried in vain to be reconciled with her husband. She now devoted herself to penance and mortification, distributing most of her income to the poor. Her children by the king were: the duke de Maine, the count de Vexin, Mesdemoiselles de Nantes, de Blois, and de Tours, and the count de Toulouse, besides three others who died in childhood. The marquis d'Antin was her son by her husband.

MONTESQUIEU, *Charles de Secondat*, baron de, a French philosopher, born at the château of La Brède, near Bordeaux, Jan. 18, 1689, died in Paris, Feb. 10, 1755. He was remarkable during his youth for diligent studies not only of jurisprudence but of literature and philosophy. At the age of 20 he composed a work designed to prove that the paganism of the ancient philosophers and authors did not merit eternal damnation. At the age of 25 he was admitted to the parliament of Bordeaux, of which he became *président à mortier* two years

later, succeeding his uncle in that office. He applied himself scrupulously to its duties, though chiefly devoted to the pursuits of literature. A literary and musical society formed at Bordeaux in 1716 was through his influence transformed into an academy of sciences, to which he contributed memoirs chiefly on natural history until almost entire blindness forbade this study. Among his early writings were dissertations on the physical history of the earth (1719) and on the policy of the Romans in their religion. His first work that attracted general attention was the *Lettres persanes* (1721). It consists of letters purporting to have been written by a Persian travelling in France, assailing beneath a transparent veil the whole system of principles prevalent in church and state. It abounds in paradoxes, jests, and sprightly satire, and also in profound views of law, commerce, and social problems. In 1726 he retired from the duties of the magistracy to devote himself solely to literature; was received into the French academy in 1728, having overcome the opposition of Cardinal Fleury by modifying obnoxious passages in his *Lettres persanes*; and soon after began to travel through Europe to collect materials for an elaborate work on politics and jurisprudence, spending about two years in England, where he became a member of the royal society. He returned to La Brède after an absence of four years, and after two years of retirement published his *Considérations sur les causes de la grandeur et de la décadence des Romains* (Paris, 1734). His great work, *De l'esprit des lois* (2 vols., 1748), was the result of 20 years of labor; 22 editions were issued in 18 months,

and it was translated into most of the European tongues. It ultimately became the oracle of the friends of moderate freedom, as distinguished from the followers of Rousseau. Montesquieu passed the latter part of his life alternately at La Brède and Paris. Among his minor writings are academical discourses; the *Dialogue de Sylla et d'Eucrate*, an explanation of the political conduct of Sulla; the *Temple de Gnide*, a romance of classical antiquity; and an *Essai sur le goût*, written for the *Encyclopédie*. The most complete editions of his works are those of Lefèvre (6 vols., Paris, 1816) and Lequieu (8 vols., 1819, and with the *éloges* by D'Alembert and Villemain, 1827). A new edition of Nugent's translation of the "Spirit of the Laws," with D'Alembert's memoir of Montesquieu, was published in Cincinnati in 1873.

MONTEVERDE, Claudio, an Italian composer, born in Cremona about 1565, died in Venice in 1649. He composed both secular and ecclesiastical music, but was particularly celebrated for his motets and madrigals, of the latter of which he produced five books.

MONTEVIDEO, a city, capital of Uruguay, South America, and of the department of its own name, on the N. shore of the estuary of the Rio de la Plata, 130 m. E. S. E. of Buenos Ayres, in lat. 34° 53' S., lon. 56° 15' W.; pop. in 1872, 105,296. It is built on a gentle elevation, at the extremity of a tongue of land jutting into the bay, and is defended by a citadel mounting 20 guns. It comprises two divisions, the old and the new town, between which traces of the old wall are still visible. A mountain in the rear, to which it owes its



Montevideo.

name, is surmounted by an antique Spanish castle. The streets are very regular, well paved, and lighted with gas. The houses are substantial; many of them have two and even three stories. Excellent water is brought from a distance of 34 m. The principal square, with

an area of two acres, is tastefully planted with trees and flowers, and has a superb fountain. On the S. side is the parish church, with turrets 225 ft. above the level of the bay; and on the N. side is the *cabildo*, containing the law courts, senate house, and prison. The government

house is a miserable edifice. The old market, once the citadel of Montevideo, and a complete fortress in itself, is the most interesting relic of the colonial period; it was erected by 2,000 Guaraní Indians, who worked seven years without pay. It is now a sort of bazaar, and serves as a barrack for troops in revolutionary times. The custom house is a fine building of modern style, 900 by 300 ft. The post office is one of the best appointed in South America; and the average number of letters and papers passing through it annually is 2,000,000. Facing the post office are the museum and the library, containing 3,653 volumes. The exchange, of modern construction, ranks among the finest public buildings on the southern continent; it cost \$160,000. There are, besides the cathedral, six churches and chapels, several convents, and an Episcopal and a Methodist church. The educational establishments comprise a university, schools for medicine, law, and other sciences, 58 public and 54 private schools, with an aggregate attendance of 10,048. The institute of public instruction is a sort of volunteer committee for the diffusion of useful knowledge. There are four large markets, six banks, savings banks, numerous clubs, mercantile associations, three theatres, a bull ring, and several ball and concert rooms. An immigrants' asylum affords adequate protection to thousands every year. The total number of immigrants landed at Montevideo in 1836 was 5,000; in 1858, 8,359; in 1868, 17,381; and in 1872, 20,000, probably including many who afterward proceeded to Buenos Ayres. The city has several prisons and a house of correction for females called *los ejercicios*. Besides the public hospitals, there are charitable institutions under the direction of the sisters of mercy, an orphan asylum, a home for the poor, and a lunatic asylum. There are three cemeteries, one of which is British. The city is the cleanest and healthiest in South America; and the suburbs, watering places, and surrounding country are extremely picturesque. The bay of Montevideo resembles a horse shoe in shape; it is about 4 m. long and 2 m. broad, but has only from 14 to 19 ft. of water, having diminished 5 ft. since the beginning of this century; but the bottom is soft, and vessels receive no damage by grounding. It can conveniently anchor 500 ships drawing 15 ft.; but it is open to the S. S. W. winds. All vessels receive and discharge their cargoes by means of launches. There are two dry docks with every facility for repairing ships. The trade of Montevideo is very considerable. The exports consist chiefly of salt beef, hides, hair, tallow, wool, bones, bone ashes, &c.; copper is brought overland from Chili and sometimes shipped here, as well as *maté* or Paraguay tea. The principal imports are cottons, woollens, hardware, flour, wine, spirits, sugar, tobacco, salt, boots, &c. The imports from the United States are flour, chairs, refined sugar, whiskey, cordage, agri-

cultural implements, &c., and chiefly lumber from New York, Boston, and Philadelphia. Sugar, coffee, *maté*, and spices are brought from Brazil; and three fourths of the manufactured goods, hardware, and machinery come from Europe. A large trade in wool, hair, &c., also exists between Montevideo and the United States. The value of the exports and imports for three years was as follows:

YEARS.	Exports.	Imports.
1870.....	\$12,179,051	\$15,008,842
1871.....	18,894,824	14,864,247
1872.....	16,489,532	18,500,724

The value of the imports for 1873 was estimated at \$22,500,000. The custom-house receipts in 1872 amounted to \$6,417,812, and in 1873 to \$6,478,209. The port movements for the same year were: entered, 1,817 vessels, tonnage 877,058; cleared, 1,839, tonnage 898,907. About 60 of the vessels were under the United States flag, and 253 were British steamers. Six British mail steamers visit the port monthly, besides four French packets, three Italian, two Brazilian, and one Anglo-Belgian. The coasting trade averages 2,000 entries annually. The city is connected by railway with Florida, 72 m. distant; a branch line to Colonia was to be commenced in 1874; and a line eastward was in course of preparation. Four lines of street horse cars are in operation. Montevideo is in telegraphic communication with Buenos Ayres, the chief towns of the interior, and the Brazilian system. The commercial and industrial establishments number 5,663, comprising 3 steam saw mills, 8 founderies, 93 factories, 13 tanneries, 52 brick kilns, 7 steam flour mills, and 9 abattoirs, in which last upward of 300,000 head of cattle are slaughtered yearly.—Montevideo (or with its full name, San Felipe de Montevideo) was founded in 1717 by the viceroy Lavala; but it remained a mere military outpost till 1726, when Francisco Alzeibar introduced the first settlers from the Canaries. In 1778 it was by royal decree declared a port, and its population and commerce rapidly increased. The city was fortified by the Spaniards in 1777. In February, 1807, it was besieged and taken by the British, who were expelled in July. After the independence of the Plate Provinces in 1811, the Brazilians seized it, but were forced to surrender it after a long siege in 1814. They retook it in 1817; and in 1828 it regained its independence by treaty, and was made the capital of Uruguay. (See URUGUAY.)

MONTEZ, Lola. See LOLA MONTEZ.

MONTEZUMA (Mex. *Montequmatín*, the sad or severe man), the name of two emperors of ancient Mexico.—**Montezuma I.**, born about 1390, died in 1464. He served as general under his uncle, who preceded him on the throne. After his accession in 1436 or 1438 he made war upon the kingdom of Chalco in defence of

his allies the Tezcucans. The Chalcos were routed in a great battle, and their chief city was entirely destroyed. A war followed with the king of Tlatelolco, who was defeated and killed. Montezuma next conquered the province of Cuihixcas, and subsequently that of Tzompahuacan. In a war with Atonaltzin, a chief of the Mixtecas, he suffered reverses which led to a confederacy between Atonaltzin and the Huexotzincas and Tlascalans against the Mexicans; but Montezuma in his first encounter with them gained a signal victory, which greatly enlarged his empire. In 1457 he conquered Cuétlachtan, a province on the Mexican gulf, and carried 6,200 of the people to Mexico, where they were sacrificed to the god of war.—**Montezuma II.**, the last of the Aztec emperors, born about 1480, succeeded his uncle Ahuizotl in 1502, and was killed June 30, 1520. He was both a soldier and a priest, and had taken an active part in the wars of his predecessor. When his election to the imperial dignity was announced to him, he was sweeping the stairs of the great temple of Mexico. At the commencement of his reign he led a successful expedition against a rebellious province, and brought back a multitude of captives to be sacrificed at his coronation. For several years he was constantly at war, and his campaigns, which extended as far as Honduras and Nicaragua, were generally successful. He made important changes in the internal administration of the empire, especially in the courts of justice, and became noted for strictness and severity in the execution of the laws, as well as for munificence to those who served him and in his expenditures for public works. He became equally noted also for arrogance, pomp, and luxury, and his heavy taxes led to many revolts. At the time of the arrival of Cortes in Mexico in 1519, Montezuma was alarmed not only by the internal troubles of his empire, but by the appearance of comets and other strange lights in the sky, and of mysterious fires in the great temple, which the seers interpreted as omens of the approaching downfall of the empire. Thus disheartened, he did not meet the invasion of the Spaniards with his usual energy. He at first forbade the white men to approach his capital, and then sent an embassy to welcome them. When Cortes entered Mexico (Nov. 8) he was received by Montezuma with courtesy and apparent good will, and at first treated the emperor with the greatest deference; but a collision between the Mexicans and a Spanish garrison at Vera Cruz soon afforded a pretext for a change of measures. At the end of a week after his arrival he waited upon Montezuma with a few of his officers under pretence of a friendly visit, and, after upbraiding him with the transactions at Vera Cruz, took him captive, and carried him to the Spanish headquarters. The emperor, fearing instant death if he made any opposition, assured his subjects, who were about to attempt a rescue as he

passed through the streets, that he accompanied the Spaniards of his own free will. Montezuma was for a while put in irons, and was so completely humbled that when Cortes offered to liberate him, he declined to return to his palace, apparently ashamed to be seen by his nobles. He was subsequently induced to swear allegiance to the king of Spain, and was kept a prisoner for seven months, till in June, 1520, the people of the capital rose in insurrection and besieged the Spaniards in their quarters. He was induced by Cortes to address his subjects from the battlements of his prison in hopes of appeasing the tumult; but though at first listened to with respect, his appeals in behalf of the white men at length exasperated the Mexicans; a shower of missiles was discharged at him, a stone struck him on the temple, and he fell senseless. He refused all remedies and nourishment, tore off the bandages, and died in a few days. Some of the children of Montezuma became Christians, and were carried to Spain. From them descended the counts of Montezuma, one of whom was viceroy of Mexico from 1697 to 1701.

MONTFAUCON, Bernard de, a French scholar, born at Soulage, Languedoc, Jan. 13, 1655, died in Paris, Dec. 21, 1741. He belonged to a noble family, and after completing his education at the college of Limoux, he served in two campaigns in Germany under Turenne, and in 1675 entered a Benedictine convent at Toulouse. Afterward he went to Paris, where he became a member of the congregation of St. Maur, and acquired a high reputation for his scholarly attainments. In 1719 he was made a member of the academy of inscriptions. His most important works are: *Palæographia Græca, sive de Ortu et Progressu Literarum Græcarum* (fol., Paris, 1708); *L'antiquité expliquée et représentée en figures* (in French and Latin, 10 vols. fol., 1719; supplement, 5 vols. fol., 1724); and *Les monuments de la monarchie française* (in French and Latin, 5 vols. fol., 1729-'33). He also published valuable editions of the works of several of the Greek fathers.

MONTFERRAT (Ital. *Monferrato*), a territory of Italy, formerly an independent duchy, bounded N. and W. by Piedmont, S. by Genoa, and E. by Milan. It was separated by a strip of Milanese territory into the divisions of Casale on the north and Acqui on the south, Casale being the capital. It often changed masters, and for more than a century was in the hands of the dukes of Mantua; but in 1703 it was bestowed by the emperor Leopold I. upon the duke of Savoy, a possession of whose house it has since remained. The territory is now divided among the provinces of Alessandria, Genoa, Coni, Turin, and Novara. The family of Montferrat was of remote origin, and very conspicuous in the middle ages.

MONTFORT, Jean (IV.) de, duke of Brittany, born in 1293, died in Hennebon, Sept. 26, 1345. He was the son of Duke Arthur II., and succeeded his brother Jean III. in 1341. The

latter had bequeathed the duchy to Charles of Blois, husband of his niece; but Montfort found little difficulty in getting possession, and Charles complained to the king, Philip of Valois, who sent an army to besiege the usurper in Nantes. In order to save the city from assault, Montfort surrendered and was carried prisoner to Paris; but in the mean time his wife, Jeanne of Flanders, put herself at the head of his partisans and withdrew to Hennebon, where she defended herself against the forces of Charles, on one occasion repelling an assault at the head of 300 cavaliers. The arrival of auxiliaries sent by Edward III. of England, to whom Montfort had done homage for Brittany, obliged Charles to raise the siege. A second attempt upon the same city in 1342 was equally unsuccessful, and Charles soon lost successively Guérande, Vannes, Carhaix, and Quimperlé. In the same year Edward III. arrived in France with fresh troops and advanced to Rennes, where Philip marched out to meet him. By the mediation of the pope a truce was concluded between the monarchs. Montfort's party, which before was barely a match for his rival's, had grown during his imprisonment. He escaped in disguise in 1345, and went to England, whence he returned with troops and made an unsuccessful attempt upon Quimper. He then retired to Hennebon, where he died a few weeks afterward, leaving a son who continued the war with Charles, and became duke as Jean V.

MONTFORT. I. *Simon de*, a French soldier, born about the middle of the 12th century, slain before Toulouse, June 25, 1218. He engaged in the fourth crusade, but when he saw the enterprise diverted from its legitimate object he declined to follow its chiefs to Constantinople, and to fulfil his vows went by himself to Palestine. On his return he took up arms again at the summons of Pope Innocent III., and in 1208 was elected leader of the crusade waged against the Albigenses of southern France, whom he mercilessly pursued and slaughtered. On the taking of Béziers (1209) more than 20,000 of its inhabitants were put to death by his permission, if not by his orders. Carcassonne was scarcely better treated; the viscount of Béziers, who commanded there, was made prisoner in an interview for negotiation; the town was forced to surrender, and many of its citizens were sentenced to death as heretics. At Lavaur, Aimery of Montreal was hanged, 80 knights were put to the sword, hundreds of poor people burned at the stake, and the lady of the castle, Aimery's sister, was thrown alive down a well, and stones were heaped over her. Montfort ruled despotically over the territories which he had wrested from Count Raymond of Toulouse in this war; and when Pedro II., king of Aragon, came to protect the latter, as his lord paramount, the crusader met him, Sept. 12, 1213, and defeated and killed him under the walls of Muret. Montfort was then proclaimed count of Tou-

louse. Raymond's son finally managed to re-enter Toulouse, where he had many adherents. Montfort besieged that city for eight months, and when attempting to storm it was killed by a stone thrown from the wall. His elder son, Amaury, succeeded him as count of Toulouse, afterward became grand constable of France, and died in 1241 on his return from Palestine.

II. *Simon de*, earl of Leicester, younger son of the preceding, the leader of the English barons in the reign of Henry III., born about 1200, killed Aug. 4, 1265. He went to England in 1231 to escape the enmity of Blanche of Castile, queen regent of France, and gained the favor of the king, who bestowed upon him the earldom of Leicester, the governorship of Gascony, and the hand of his own sister Eleanor, countess dowager of Pembroke. He governed Gascony with an iron hand, and made his power particularly felt by the native lords, but was popular with the English. In England he became the head of the barons who conspired to curtail the king's prerogative. Henry III. having convoked a parliament in 1258, Montfort appeared in arms with his confederates, and constrained the king to sign the provisions of Oxford, by which the whole legislative and executive power was thrown into the hands of 24 barons, who were controlled by Montfort. An agreement was proposed between the nobles and the king through the arbitration of Louis IX. of France; but his award not being acceptable to the former, both parties took arms. In May, 1264, Montfort defeated the royal army at Lewes in Sussex, and captured the king. In January, 1265, he summoned a parliament, in which, for the first time on record, representatives of boroughs were admitted. His power was now at its height, but his overbearing conduct excited discontent even among the adherents of the national cause; and the king's son, Prince Edward, who was kept as a hostage, having made his escape, many of his former opponents joined his standard. Montfort was hemmed in at Evesham by superior numbers, and was slain with one of his sons and many barons, while his army was completely routed. The family of Montfort was expelled from England.

MONTGOLFIER. See **AERONAUTICS.**

MONTGOMERY, the name of counties in 18 of the United States. I. An E. county of New York, intersected by the Mohawk river, which is here joined by the Schoharie and other smaller streams; area, 356 sq. m.; pop. in 1870, 34,457. It has a fertile soil, especially in the valley of the Mohawk. The Erie canal and the New York Central railroad pass through it. The chief productions in 1870 were 61,659 bushels of wheat, 175,654 of Indian corn, 662,516 of oats, 86,605 of barley, 100,769 of buckwheat, 194,041 of potatoes, 717,277 lbs. of hops, 58,847 of wool, 1,174,822 of butter, 1,514,482 of cheese, 21,770 bushels of peas and beans, and 104,839 tons of hay. There were 7,606 horses, 26,317 milch cows, 8,557 other

cattle, 12,884 sheep, and 6,773 swine; 2 manufacturing of agricultural implements, 10 of brooms and brushes, 1 of carpets, 21 of cheese, 9 of hosiery, 1 of forged and rolled iron, 6 of iron castings, 3 of malt, 1 of linseed oil, 1 of washing machines, 1 of woollen goods, 10 tanneries, 16 saw mills, and 13 flour mills. Capital, Fonda. **II.** A S. E. county of Pennsylvania, bounded S. W. by the Schuylkill river; area, 450 sq. m.; pop. in 1870, 81,612. The surface is undulating and the soil is rich, especially along the Schuylkill. It is intersected by the Philadelphia, Germantown, and Norristown, the Philadelphia and Reading, the Northern Pennsylvania, and other railroads. The chief productions in 1870 were 340,911 bushels of wheat, 150,158 of rye, 1,026,865 of Indian corn, 791,272 of oats, 456,345 of potatoes, 3,104,748 lbs. of butter, 195,057 of cheese, and 112,287 tons of hay. There were 13,281 horses, 31,179 milch cows, 6,687 other cattle, 3,623 sheep, and 18,931 swine; 11 manufacturing of agricultural implements, 20 of brick, 54 of carriages and wagons, 1 of coal oil, 8 of cotton goods, 12 of furniture, 10 of forged and rolled iron, 3 of nails and spikes, 6 of pig iron and 6 of castings, 19 of lime, 6 of machinery, 2 of linseed oil, 8 of stone and earthen ware, 46 of turned and carved wood, 22 of woollen goods, 15 tanning and currying establishments, 44 flour mills, and 13 saw mills. Capital, Norristown. **III.** A central county of Maryland, bounded N. E. by the Patuxent, and S. W. by the Potomac river; area, 440 sq. m.; pop. in 1870, 20,563, of whom 7,434 were colored. The surface is moderately uneven; the soil is fertile along the banks of the rivers. It is traversed by the Metropolitan branch of the Baltimore and Ohio railroad, and the Chesapeake and Ohio canal passes along the S. W. border. The chief productions in 1870 were 309,418 bushels of wheat, 25,234 of rye, 638,047 of Indian corn, 171,242 of oats, 179,562 of potatoes, 630,000 lbs. of tobacco, 17,880 of wool, 188,334 of butter, and 12,735 tons of hay. There were 5,211 horses, 4,691 milch cows, 5,448 other cattle, 6,812 sheep, and 13,267 swine. Capital, Rockville. **IV.** A S. W. county of Virginia, bounded W. by New river and drained by the head waters of Staunton river; area, 490 sq. m.; pop. in 1870, 12,556, of whom 2,882 were colored. The surface is mountainous and the soil generally rocky, but productive near the rivers. The Atlantic, Mississippi, and Ohio railroad passes through it. The chief productions in 1870 were 100,761 bushels of wheat, 16,252 of rye, 146,723 of Indian corn, 78,168 of oats, 12,273 of potatoes, 204,747 lbs. of tobacco, 13,737 of wool, 159,212 of butter, and 4,106 tons of hay. There were 1,867 horses, 2,240 milch cows, 4,633 other cattle, 4,966 sheep, and 8,089 swine. Capital, Christiansburg. **V.** A S. county of North Carolina, bounded W. by Yadkin river, and drained by its branches; area, 500 sq. m.; pop. in 1870, 7,487, of whom 2,128 were colored. The sur-

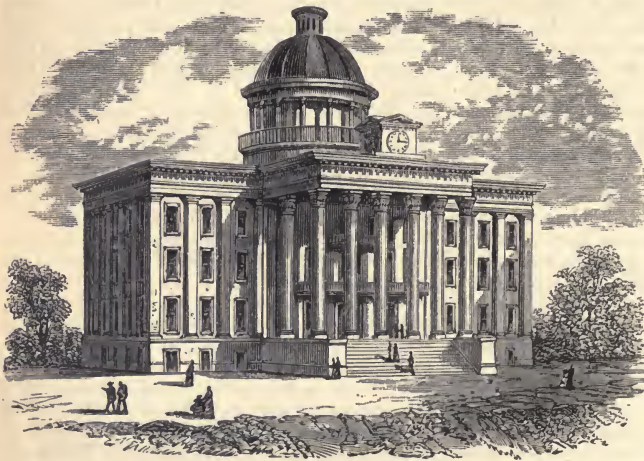
face in the west is hilly, and much of the soil is fertile. The chief productions in 1870 were 50,478 bushels of wheat, 118,589 of Indian corn, 39,177 of oats, 22,155 of sweet potatoes, 13,992 lbs. of tobacco, 23,782 of wool, 76,034 of butter, and 632 bales of cotton. There were 1,144 horses, 2,278 milch cows, 3,495 other cattle, 8,320 sheep, and 9,893 swine. Capital, Lawrenceville. **VI.** A S. E. county of Georgia, bounded N. E. by Pendleton's river, S. by the Altamaha, and S. W. by the Little Ocmulgee, and intersected by the Oconee; area, 624 sq. m.; pop. in 1870, 3,586, of whom 1,108 were colored. The surface is level and the soil sandy. The chief productions in 1870 were 70,405 bushels of Indian corn, 15,852 of oats, 11,437 of sweet potatoes, 21,853 lbs. of wool, 10,261 of butter, 391 bales of cotton, and 5,309 gallons of cane molasses. There were 589 horses, 3,339 milch cows, 9,222 other cattle, 9,853 sheep, and 9,246 swine. Capital, Mount Vernon. **VII.** A S. E. county of Alabama, bounded N. W. by the Alabama and Coosa rivers, and N. by the Tallapoosa; area, about 800 sq. m.; pop. in 1870, 43,704, of whom 31,285 were colored. The surface is uneven and the soil generally fertile. Several railroads centre at Montgomery, and the Mobile and Girard crosses the S. E. corner. The chief productions in 1870 were 602,549 bushels of Indian corn, 25,648 of sweet potatoes, 25,517 bales of cotton, 3,735 lbs. of rice, and 1,599 gallons of cane molasses. There were 1,823 horses, 4,250 mules and asses, 3,027 milch cows, 5,569 other cattle, 980 sheep, and 13,909 swine; 2 flour mills, 4 saw mills, 2 founderies, and 2 railroad repair shops. Capital, Montgomery, which is also the capital of the state. **VIII.** A N. central county of Mississippi, drained by Big Black river, formed since the census of 1870 from Carroll and Choctaw counties; area, about 525 sq. m. The surface is gently undulating, and the soil productive. It is traversed by the Mississippi Central railroad. Capital, Winona. **IX.** A N. E. county of Texas, drained by San Jacinto river and its tributaries; area, 852 sq. m.; pop. in 1870, 6,483, of whom 3,351 were colored. It has a rolling surface, with an abundance of good timber, and the soil, with the exception of some sandy pine barrens, is fertile. The Houston and Great Northern railroad passes through it. The chief productions in 1870 were 163,290 bushels of Indian corn, 41,945 of sweet potatoes, and 3,485 bales of cotton. There were 1,929 horses, 4,184 milch cows, 10,857 other cattle, 1,406 sheep, and 13,994 swine. Capital, Montgomery. **X.** A W. county of Arkansas, drained by Washita river and its branches; area, 1,050 sq. m.; pop. in 1870, 2,984, of whom 120 were colored. The surface is mostly mountainous. The chief productions in 1870 were 3,072 bushels of wheat, 93,739 of Indian corn, 2,596 of oats, 273 bales of cotton, 3,044 lbs. of tobacco, 2,051 of wool, 19,252 of butter, 2,007 of honey, and 2,065 gallons of sorghum molasses. There

were 570 horses, 945 milch cows, 1,756 other cattle, 1,318 sheep, and 5,762 swine. Capital, Mount Ida. **XI.** A N. W. county of Tennessee, bordering on Kentucky, and drained by Cumberland river and its branches; area, 500 sq. m.; pop. in 1870, 24,747, of whom 11,670 were colored. The Louisville, Nashville, and Great Southern railroad traverses it. The chief productions in 1870 were 174,523 bushels of wheat, 810,194 of Indian corn, 62,378 of oats, 25,403 of Irish and 33,490 of sweet potatoes, 4,856,378 lbs. of tobacco, 14,009 of wool, and 217,981 of butter. There were 3,023 horses, 2,569 mules and asses, 3,272 milch cows, 4,233 other cattle, 3,015 sheep, and 28,205 swine; 13 flour mills, 10 saw mills, 4 tanneries, 6 distilleries, and 1 woollen mill. Capital, Clarksville. **XII.** A N. E. county of Kentucky; area, 275 sq. m.; pop. in 1870, 7,557, of whom 2,699 were colored. The surface is hilly and mountainous, and most of the soil fertile. The Mount Sterling division of the Louisville, Cincinnati, and Lexington railroad terminates at the county seat. The chief productions in 1870 were 31,651 bushels of wheat, 16,259 of rye, 542,710 of Indian corn, 43,945 of oats, 16,285 of potatoes, 17,902 lbs. of wool, 87,244 of butter, and 2,087 tons of hay. There were 2,660 horses, 1,402 mules and asses, 1,977 milch cows, 8,606 other cattle, 5,215 sheep, and 12,641 swine. Capital, Mount Sterling. **XIII.** A S. W. county of Ohio, drained by Miami river and its branches; area, 480 sq. m.; pop. in 1870, 64,006. The surface is undulating, and the soil generally fertile. Trenton limestone is abundant. The Miami canal passes through it, and several railroads terminate at Dayton. The chief productions in 1870 were 824,003 bushels of wheat, 1,088,781 of Indian corn, 409,804 of oats, 83,002 of barley, 142,425 of potatoes, 45,197 of flax seed, 636,300 lbs. of flax, 3,963,183 of tobacco, 23,047 of wool, 650,826 of butter, and 19,301 tons of hay. There were 9,183 horses, 8,775 milch cows, 7,925 other cattle, 7,095 sheep, and 25,761 swine; 14 manufactories of agricultural implements, 17 of brick, 34 of carriages and wagons, 2 of cotton goods, 2 of dressed flax, 14 of machinery, 8 of stone work, 7 of linseed oil, 13 of saddlery and harness, 4 of sash, doors, and blinds, 2 of woollen goods, 16 iron foundries, 13 tanneries, 8 distilleries, 11 breweries, 22 saw mills, 4 planing mills, and 25 flour mills. Capital, Dayton. **XIV.** A W. county of Indiana; area, 504 sq. m.; pop. in 1870, 23,765. The surface is level or undulating, and the soil is generally good. The Louisville, New Albany, and Chicago, and the Indianapolis, Bloomington, and Western railroads pass through it. The chief productions in 1870 were 706,172 bushels of wheat, 1,004,706 of Indian corn, 89,509 of oats, 69,409 of potatoes, 149,826 lbs. of wool, 391,403 of butter, and 18,104 tons of hay. There were 9,466 horses, 6,590 milch cows, 15,721 other cattle, 37,533 sheep, and 34,879 swine; 7 manufactories of furniture, 7 of brick, 10 of carriages, 6 of cooperage, 1 of iron castings, 2 of

machinery, 7 of saddlery and harness, 4 of woollen goods, 1 pork-packing establishment, 23 saw mills, 1 planing mill, and 21 flour mills. Capital, Crawfordsville. **XV.** A S. W. county of Illinois; area, 544 sq. m.; pop. in 1870, 25,314. It has a diversified surface, partly covered with forests, and a rich soil. The Indianapolis and St. Louis and the Toledo, Wabash, and Western railroads pass through it. The chief productions in 1870 were 744,950 bushels of wheat, 1,527,898 of Indian corn, 668,424 of oats, 66,515 of potatoes, 54,608 lbs. of wool, 276,734 of butter, and 29,871 tons of hay. There were 12,447 horses, 6,400 milch cows, 7,510 other cattle, 12,881 sheep, and 34,773 swine; 7 manufactories of carriages, 1 of cars, 3 of cooperage, 5 of furniture, 1 of iron castings, 2 of machinery, 10 of saddlery and harness, 2 of woollen goods, 9 saw mills, 2 breweries, and 12 flour mills. Capital, Hillsborough. **XVI.** A S. W. county of Iowa, drained by Nishnabotona and West Nodaway rivers, tributaries of the Missouri; area, 432 sq. m.; pop. in 1870, 5,934. The surface is undulating and the soil fertile. The Burlington and Missouri river railroad and its Red Oak branch pass through it. The chief productions in 1870 were 59,712 bushels of wheat, 323,168 of Indian corn, 37,393 of oats, 23,991 of potatoes, 18,492 lbs. of wool, 87,220 of butter, and 9,079 tons of hay. There were 1,461 horses, 1,256 milch cows, 2,475 other cattle, 4,503 sheep, and 10,287 swine; 7 flour mills, and 3 lumber mills. Capital, Frankfort. **XVII.** An E. county of Missouri, bounded S. by the Missouri river; area, 576 sq. m.; pop. in 1870, 10,405, of whom 939 were colored. The surface is hilly in the region of the river, and in other parts undulating. Limestone, iron ore, and coal are found. The St. Louis, Kansas City, and Northern railroad passes through it. The chief productions in 1870 were 74,150 bushels of wheat, 543,112 of Indian corn, 297,035 of oats, 203,170 lbs. of tobacco, 38,083 of wool, 16,973 of butter, and 6,740 tons of hay. There were 3,375 horses, 2,943 milch cows, 5,214 other cattle, 10,350 sheep, and 14,041 swine. Capital, Danville. **XVIII.** A S. E. county of Kansas, bordering on Indian territory, and intersected by Verdigris river; area, 624 sq. m.; pop. in 1870, 7,564. It is traversed by the Leavenworth, Lawrence, and Galveston railroad. The surface consists of rolling prairies, and the soil is fertile. The chief productions in 1870 were 12,665 bushels of Indian corn, 1,443 of potatoes, and 1,555 tons of hay. There were 1,629 horses, 1,595 milch cows, 4,090 other cattle, 674 sheep, 1,065 swine, and 9 saw mills. Capital, Independence.

MONTGOMERY, a city of Montgomery co., Alabama, capital of the county and state, and the second city of the state in population and importance, situated on a high bluff on the left bank of the Alabama river, about 300 m. above Mobile, in lat. 32° 22' N. and lon. 86° 23' W.; pop. in 1860, 8,843; in 1870, 10,588, of whom 5,183 were colored. The river is navigable to

this point by steamers at all seasons, and four lines of railroad furnish means of communication with all sections of the state, viz.: the Mobile and Montgomery; Montgomery and Eufaula; South and North Alabama; and Western of Alabama. The city is the point of supply and shipment of a large and fertile cotton region. Its trade in groceries is important, and its receipts of cotton are large. The entire trade amounts to nearly \$10,000,000 a year. The chief manufacturing establishments are an iron foundry and a flouring mill. There are two national banks, with a joint capital of \$425,000, and three private banking houses. The state house, which occupies an elevated situation on Capitol hill, was erected in 1851 at a cost of \$75,000, the original capitol having been destroyed by fire in 1849. The dome commands a fine view of the city and adjacent country. Among other public



State Capitol, Montgomery.

buildings are the court house, a fine city hall containing a market and rooms for the fire department, and the theatre. The city is lighted with gas, and supplied with water by artesian wells and water works (from the river) of sufficient capacity to keep in reservoir three months' supply for 25,000 people. The public schools are attended by about 300 white and 500 colored children, and there are several private schools, with a large attendance. Three daily newspapers (issuing also weekly editions) and a weekly agricultural journal are published. There are 14 churches, viz.: 4 Baptist (2 colored), 1 Episcopal, 1 Jewish, 5 Methodist (2 colored and 1 Northern), 1 Presbyterian, 1 Protestant Methodist, and 1 Roman Catholic.—Montgomery was laid out in 1817, and the seat of government was removed to it from Tuscaloosa in 1847. It was the seat of the confederate government from Feb. 4, 1861, to the following May, when it was removed to

Richmond. The city was evacuated by the confederates April 11, 1865, after burning 80,000 bales of cotton, and on the following day it was occupied by the federal forces under Gen. Wilson, when the arsenal, railroad depots, and foundry were destroyed.

MONTGOMERY, James, a British poet, born in Irvine, Ayrshire, Nov. 4, 1771, died near Sheffield, April 30, 1854. His father was a Moravian preacher, and James, being intended for the same office, was sent in his seventh year to a Moravian settlement at Fulneck, near Leeds, to complete his education. Here he remained ten years, distinguished only for indolence and melancholy. The brethren at Fulneck then apprenticed him to a grocer in Mirfield. Before the age of 14 he had written a mock heroic poem of 1,000 lines, and had commenced an epic to be called "The World." He ran away in June, 1789, but after many wanderings

engaged again as shop boy in Wath, a village of Yorkshire. A year later he sent a volume of manuscript poetry to Mr. Harrison, a London publisher, and soon after went to London himself. Harrison refused his poems, but engaged him as his shopman. Toward the end of 1792 he became clerk to Joseph Gales, editor and publisher of the "Sheffield Register," a newspaper of revolutionary tendencies. Gales fled to America to avoid arrest for treason, and Montgomery started a new weekly journal called the "Sheffield Iris," advocating peace

and reform principles. The first number appeared July 4, 1794, and he edited it till Sept. 27, 1825. Almost immediately after the first appearance of the "Iris," he was fined £20, and sentenced to three months' imprisonment, for printing a doggerel ballad on "The Fall of the Bastille" for a poor hawker. Again in 1796 he was found guilty of sedition, fined £30, and sentenced to six months' imprisonment, for publishing in his newspaper an account of a riot in Sheffield. He was confined in York castle, where he wrote a small volume of poems entitled "Prison Amusements," published in 1797. His gentle yet earnest character, and his literary ability, gradually won him the regard of his political opponents, and he began to take a high rank as a sacred poet. In 1806 he published "The Wanderer of Switzerland," in 1810 "The West Indies" and "Greenland," and in 1812 "The World before the Flood," which attained great popularity. In 1835 a

pension of £150 was bestowed on him by the queen. He was a liberal whig, and an ardent slavery abolitionist, and in his manhood reunited himself with the Moravians. Besides the works mentioned, he published "The Pelican Island, and other Poems" (1827), and "Original Hymns" (1853); and in prose, "Lectures on Poetry and General Literature, delivered at the Royal Institution in 1830 and 1831" (1833). Collected editions of his poetical works were published in 6 vols. in 1836, 4 vols. in 1841 and 1855, and 1 vol. in 1850 and 1855. Memoirs, with correspondence and journals (7 vols. 8vo, 1855-'6), were published by John Holland and James Everett.

MONTGOMERY, Richard, an American general, born near Raphoe, Ireland, Dec. 2, 1736, killed in the attack on Quebec, Dec. 31, 1775. At the age of 18 he obtained a commission in the British army. He was at the siege of Louisburg in 1758, distinguished himself in the expeditions against Martinique and Havana, and in 1763 revisited Europe. In 1772 he emigrated to New York, married a daughter of Judge Robert R. Livingston, and in 1773 settled in Rhinebeck. In 1775 he represented Dutchess county in the provincial congress, and in the same year was appointed brigadier general in the army of the united colonies, and was attached as senior brigadier to the larger of the two divisions sent to Canada in the summer. The illness of Gen. Schuyler threw the command of the division upon Montgomery, who successively acquired possession of Chambly, St. John's, and Montreal, thereby becoming in the middle of November master of a great part of Canada. Effecting a junction on Dec. 4 with Arnold's troops, he immediately took a position before Quebec. On Dec. 9 he was made a major general. It was determined to attempt to capture the place by a *coup de main*, and on Dec. 31, at 2 A. M., Montgomery headed the attack on the upper town. He reached the first barrier, which was quickly carried, pressed eagerly on to the second, and with his two aides fell dead at the first and only discharge by the British artillerymen, his troops retreating in disorder. Congress erected a monument to him in the front of St. Paul's church, New York. In 1818 the state of New York caused his remains to be removed and placed beneath the monument.

MONTGOMERY, Robert, an English poet, born in Bath in 1807, died in Brighton, Dec. 3, 1855. He was the son of a theatrical clown named Gomery, and assumed the name of Montgomery. He early conducted "The Inspector," a weekly journal in Bath, and published "The Stage Coach," a poetical collection, "The Age Reviewed, a Satire" (1827), "The Omnipresence of the Deity," his most popular poem, and a volume of miscellaneous verses (1828), and "Satan" (1829). In 1830 he entered Lincoln college, Oxford, and in 1835 became curate of Whittington, Shropshire. Subsequently he was minister of Percy street chapel, London,

and for a time of St. Jude's chapel, Glasgow. He published numerous works in addition to those mentioned, prominent among which were a series of "Meditations" upon Scripture subjects. His poems, for a time immensely popular, were subjected to a crushing criticism by Macaulay in the "Edinburgh Review" for April, 1830.

MONTGOMERYSHIRE, a county of Wales, bordering on the counties of Denbigh, Salop (England), Radnor, Cardigan, and Merioneth; area, 755 sq. m.; pop. in 1871, 67,789. It consists mostly of wild, rugged, and sterile mountains, the highest of which is Plinlimmon, on the S. W. border of the county, its culminating peak, 2,481 ft. high, being just within the border of Cardiganshire. There are some fertile valleys, the best being that of the Severn, whose head waters traverse the county. The chief rivers, besides the Severn, are the Vyrnwy, Wye, and Dovey. In the districts bordering on England agriculture has made considerable progress. Copper, zinc, coal, and limestone are mined. The staple manufactures are flannels, and a species of cotton called "Welsh plains." Capital, Montgomery.

MONTH (Sax. *mona*, the moon), a period of time defined by one revolution of the moon around the earth, and hence equal to 29 days, 12 hours, 44 minutes, and 3 seconds. This division of time, the lunar month, was used by the Chaldeans and Egyptians, and is still by the Jews, Turks, and many uncivilized nations, as the most distinctly marked period of the year. But if the year be made to comprise 12 of these months, the seasons will soon be found to fall back from those months to which they originally belonged, so that in 34 years each month would fall in each of the seasons. The civil year is divided into 12 months of an average length of 30 days, 10 hours, and 30 minutes. But these (called calendar months) are not equal, some (April, June, September, and November) consisting of 30, and the remainder of 31 days, except February, to which only 28 days are assigned, with the addition in leap years (every fourth year) of one more day. In popular language a month is often understood to be four weeks. This is even laid down by Blackstone as the legal definition of the term, so that a lease for 12 months is only for 48 weeks; but the expression "a twelvemonth" has been legally held to mean a solar year. In ecclesiastical and commercial matters, however, month always means a calendar month; and this is generally the legal meaning of the word in all relations in the United States.

MONTHOLON, or *Montholon-Sémonville*, Charles Tristan, count and afterward marquis de, a French soldier, born in Paris, July 21, 1783, died Aug. 21, 1853. The son of a marquis, he became in 1798 a non-commissioned officer in a regiment of cavalry, and in less than two years reached the rank of *chef d'escadron*. He evinced great zeal in behalf of Bonaparte on the 18th Brumaire, and was afterward promo-

ted for his services in Italy, Germany, and Poland, especially distinguishing himself, as aide-de-camp to Berthier, in the battle of Wagram (1809), after which he was made a count and attached to the personal staff of Napoleon. He was soon after appointed chamberlain to the emperor, and intrusted with several diplomatic missions. In 1814 he was made general of brigade, and became commandant of the department of the Loire. He joined the emperor on his return in 1815, acted as his aide-de-camp during the hundred days, fought for him to the last, and followed him to St. Helena. He witnessed his death, was appointed one of his executors, and returning to Europe published, in conjunction with Gen. Gourgaud, *Mémoires pour servir à l'histoire de France sous Napoléon, écrits à Ste. Hélène sous sa dictée* (8 vols. 8vo, Paris, 1823). His fortune having been ruined by his protracted absence, he tried to retrieve it by commercial enterprise, but became involved in debt and fled to Belgium. He was restored to the army after the revolution of 1830. He accompanied Prince Louis Napoleon in his attempt at Boulogne in 1840, and shared his imprisonment at Ham, but at the end of a few years received a pardon. While in prison he wrote *Récits de la captivité de l'empereur Napoléon à Ste. Hélène* (Paris, 1847). After the revolution of 1848 he became a member of the legislative assembly.

MONTHYON. See **MONTHYON**.

MONTI, Vincenzo, an Italian poet, born at Fusignano, near Ferrara, Feb. 19, 1754, died in Milan, Oct. 13, 1828. He was educated at Faenza and the university of Ferrara, where he read with enthusiasm the Latin and Italian poets, and before his 16th year published Latin elegies and an Italian poem on the prophecy of Jacob. The influence of Dante appears in his "Vision of Ezekiel," written two years later. His verses attracted the attention of Cardinal Borghese, who conducted him to Rome. In 1778 he was appointed secretary to Braschi, nephew of Pope Pius VI. Assuming the clerical habit, he was called the abbate Monti, though he never took orders. He became a member of the academy of Arcadians, with the principal members of which he was soon at war on account of his satires and impatience of criticism. In his drama *Aristodemo* he aimed to combine the vigor of Alfieri with greater smoothness and elegance. A second, *Galeotto Manfredi*, in which he violates his own principles of classicality, proved a failure. In 1793 he was selected by the pontifical government to celebrate the assassination of the French ambassador Bassville in a poem conformed to their political views, and published in 15 days his *Bassvilliana*, which was the first effective expression of the horror of monarchical and Catholic Europe at the French revolution. The first edition of his mythological poem *Musogonia* (1796) was agreeable to the papal government; but he made Bonaparte the hero of the second edition (1798), and also

of a still finer poem entitled *Prometeo*. He was successively secretary of the directory of the Cisalpine republic and commissary in the Romagna. He fled to France on the Austro-Russian invasion in 1799, but returned to Milan after the battle of Marengo, and published the tragedy of *Caio Gracco*. Appointed professor of belles-lettres in the college of Milan in 1803, he was immediately promoted to the chair of rhetoric in the university of Pavia. He celebrated in poems the leading events of Napoleon's career, and also made a translation of the Iliad, though he had studied Homer only through translators. His most important prose production was a philological work, in which he assailed the principles of the Della Crusceans. A complete edition of his works was published in 8 vols. (Bologna, 1825-'8), a select edition in 5 vols. (Milan, 1832-'4), and an edition in 6 vols. (Milan, 1839 *et seq.*).

MONTIGNY, Rose Marie Cizos Lemoine. See **CHÉRI**.

MONTLUÇON, a town of France, in the department of Allier, on the Cher, and on the canal du Berry, 111 m. W. N. W. of Lyons; pop. in 1866, 18,675. It has ruins of an ancient castle and of old walls and towers, an industrial school, iron works, and extensive manufactories of mirrors, glass, linen, coarse woollens, and chemicals. It is connected by railway with Moulins, Bourges, and Limoges.

MONTMAGNY, a S. county of Quebec, Canada, bounded N. W. by the St. Lawrence river below Quebec, and S. E. by Maine; area, 623 sq. m.; pop. in 1871, 13,555, of whom 13,449 were of French origin or descent. It is watered by the Rivière du Sud and by the head streams of the St. John, and is traversed by the Grand Trunk railway. Capital, St. Thomas.

MONTMARTRE. See **PARIS**.

MONTMÉDY (anc. *Mons Medius*; mediæval, *Mons Maledictus*), a town and fortress of the fourth class of France, in the department of Meuse, on the river Chiers and on the railway between Sedan and Thionville, 150 m. E. N. E. of Paris, 26 m. N. of Verdun, and 4 m. W. of the frontier of Luxemburg; pop. in 1866, 2,135. It is divided into an upper and a lower town. The former, constituting the citadel of the place, is situated upon the summit and a steep rock, and is fortified with an enceinte having eight bastions, with outer works and a moat, protected by six demilunes. The lower town, called Bas-Médy, is surrounded by a strong wall with eight bastions and three gates. The fortifications were in part planned by Vauban, but have been greatly improved. The town is of little importance except in a military point of view. Montmédy, after having been several times attacked by detachments of the German army during September, 1870, and a sortie having been made from the lower town on Oct. 11, it was finally invested by a Prussian force, Nov. 16-28, and a bombardment was begun on Dec. 12. On Dec. 14, its commander, Maj. Tessier, surrendered the fortress, with

3,000 men and 65 cannon, to Gen. von Kammeke, the Prussian commander.

MONTMORENCY, a N. E. county of the S. peninsula of Michigan, watered by Black and Thunder Bay rivers; area, 576 sq. m.; returned as having no population in 1870. The surface consists of rolling table lands; the climate is severe, and the soil not fertile.

MONTMORENCY, an E. county of Quebec, Canada, bounded S. E. by the St. Lawrence, and drained by the Montmorency and St. Anne rivers; area, 2,183 sq. m.; pop. in 1871, 12,085, of whom 11,602 were of French origin or descent. It has an uneven surface and fertile soil. The isle of Orleans in the St. Lawrence river is included in the county. Capital, Château Richer.

MONTMORENCY, or **Montmorenci**, a river of the province of Quebec, Canada, which rises in Snow lake, Montmorency co., and flowing S. empties into the St. Lawrence, about 8 m. below Quebec. Just above its mouth it falls over a nearly perpendicular precipice a distance of 250 ft., with a width of 50 ft. About $1\frac{1}{2}$ m. above the falls the river has worn a series of natural steps in the limestone rock. At the foot of the falls a cone of ice is formed every winter, sometimes 200 ft. high. The falls of Montmorency are much resorted to by tourists and visitors from Quebec, and the drive to them from the city is very beautiful.

MONTMORENCY, a town of France, in the department of Seine-et-Oise, 7 m. N. of the enceinte of Paris; pop. about 3,500. It is on a hill commanding a fine view. There is a handsome Gothic church of the 14th or 15th century. The place is celebrated from the house near it called l'Ermitage, in which Jean Jacques Rousseau resided in 1756-'8, and wrote his *Nouvelle Héloïse*. It was a peasant's house belonging to Mme. d'Épinay. It was afterward occupied by Grétry the composer, who died there in 1813. It now forms part of a large mansion; only the garden is as it was in Rousseau's time. Rousseau's *Contrat social* and *Émile* were also written in Montmorency, though not in the Hermitage. The town grew up around the château of Montmorency, built in 1108, no trace of which remains.

MONTMORENCY, a French feudal family, deriving its title from the château of the same name, and tracing its origin to the middle of the 10th century. Its members were styled "the first barons of France," or "the first Christian barons." Among them were six grand constables, twelve marshals, and four grand admirals of France, besides cardinals, grand masters, and knights of all European orders, and they intermarried several times with royal families. Two branches of the family established themselves in the Netherlands. Among their descendants were the count of Horn (Philip II. de Montmorency-Nivelle), executed with Egmont in Brussels, June 5, 1568; Floris de Montmorency, baron de Montigny, executed by order of Philip II., Oct. 14,

1570; and Marshal Luxembourg. The following are the chief historical characters of the French branch. **I. Anne**, first duke de Montmorency, born at Chantilly, March 15, 1492, died in Paris, Nov. 12, 1567. He distinguished himself first in the battle of Ravenna, in 1512. In 1515 he followed Francis I. to Italy, and fought bravely at Marignano. He exhibited great activity and firmness during the siege of Mézières in 1521, and for his gallantry in the disastrous battle of Bicoca, near Milan, in 1522, was created marshal. In 1524 he forced the constable de Bourbon to raise the siege of Marseilles. In 1525 he was made prisoner at the battle of Pavia, but was ransomed. He became governor of Languedoc and grand master of France in 1526, and was intrusted with the management of the finances. His avarice displeased the Genoese admiral Doria, who broke off his alliance with the king of France, and became one of the staunchest supporters of Charles V. In 1536 Montmorency laid waste Provence, which the imperial army had entered, and by prolonging the campaign nearly destroyed the enemy. Two years later he was made constable. In 1541 court intrigues caused his disgrace, and he retired to Chantilly; but after the death of Francis I. his influence at court became paramount. In 1548 he put down an insurrection in Guienne with cruel rigor. In 1551 his baronial estate was erected into a duchy by Henry II. He was defeated and taken prisoner at the battle of St. Quentin, Aug. 10, 1557, by Duke Philibert Emanuel of Savoy, and, anxious to secure his release, was instrumental in bringing about in 1559 the disadvantageous peace of Cateau-Cambrésis. During the reign of Francis II. he lived in retirement; but he played a conspicuous part under Charles IX., and with the duke of Guise and Marshal Saint-André, with whom he formed a kind of triumvirate, was an uncompromising enemy of the Huguenots. At the battle of Dreux, Dec. 19, 1562, where he shared the command with his two colleagues, he was wounded and taken by the Protestants, although Guise won the day. Released by the peace of Amboise in 1563, he retook Havre from the English. In 1567, at the head of the Catholic army, he fought a drawn battle with the prince de Condé, near St. Denis, in which he was mortally wounded. **II. Henri II.**, fourth and last duke de Montmorency, grandson of the preceding, born in Chantilly, April 30, 1595, executed in Toulouse, Oct. 30, 1632. Louis XIII. appointed him admiral of France before he was 17 years old. He succeeded his father as governor of Languedoc, fought against the Protestants, distinguished himself at the sieges of Montauban and Montpellier, and in 1625 conquered the islands of Ré and Oléron. He now sold his office of admiral to Richelieu. Montmorency continued to oppose the duke de Rohan, who remained in arms for eight months after the taking of La Rochelle, and thus contributed to bring about the peace of Alais

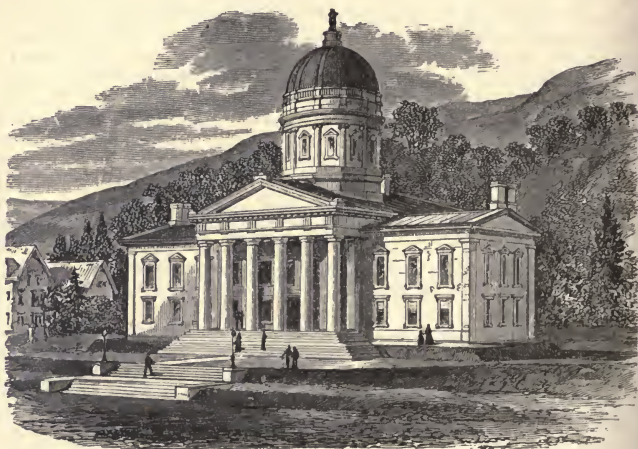
(1629), which terminated the last of the religious civil wars in France. In the same year he distinguished himself in Italy, and was finally made a marshal. After his return he joined Gaston of Orleans in his rebellion, and assembled his troops while Gaston was entering the kingdom from Lorraine at the head of a few thousand adventurers; but in the battle of Castelnaudary, Sept. 1, 1632, he was deserted by his ally and taken prisoner. He was sentenced to death by the parliament of Toulouse, and by order of Richelieu publicly beheaded in the great square. His life was written by Ducros, one of his officers (4to, 1633). **III. Matthieu Jean Félicité**, viscount and afterward duke de Montmorency-Laval, born in Paris, July 10, 1767, died there, March 24, 1826. He served in the American war, and was a deputy in 1789 to the constitutional assembly, where, during the famous night of Aug. 4, he was among the foremost to move for the spontaneous renunciation of feudal privileges and titles of nobility. Alarmed by the progress of the revolution, he emigrated in 1792, and returned in 1795, but kept aloof from politics, and lived on terms of intimate friendship with Mmes. de Staël and Récamier. He received no favors from Napoleon, but on the return of the Bourbons was appointed aide-de-camp to the count of Artois and peer of France, and on Dec. 24, 1821, minister of foreign affairs. He and Chateaubriand were the French plenipotentiaries at the congress of Verona, and on his return he was made governor to the infant duke of Bordeaux. Although he had no literary merit, he was elected in 1825 a member of the French academy. He died while at prayer in church.

MONTMORENCY, François de. See BOUTEVILLE.

MONTOUR, an E. central county of Pennsylvania, intersected in the south by the N. branch of the Susquehanna river, and drained by Chillisquaque, Mahanouring, and Big Roaring creeks; area, 210 sq. m.; pop. in 1870, 15,344. Its surface is traversed E. and W. by barren ridges, including Montour's and Limestone ridges and Muncy hills. There are several mines producing large quantities of iron. The valleys are fertile. It is traversed by the North Branch canal, and by the Catawissa railroad, passing through Danville. The chief productions in 1870 were 111,384 bushels of wheat, 176,941 of Indian corn, 179,518 of oats, 54,241 of potatoes, 192,048 lbs. of butter, and 10,142 tons of hay. There were 1,692 horses,

2,340 milch cows, 1,736 other cattle, 2,809 sheep, and 5,697 swine; 2 manufactories of forged and rolled iron, 3 of pig iron, 5 of castings, 2 breweries, 5 flour mills, 4 saw mills, and 8 tanneries. Capital, Danville.

MONTPELIER, a town of Washington co., Vermont, capital of the county and state, situated on the Onion river, here spanned by a substantial bridge, and on the Central Vermont and the Montpelier and Wells River railroads, 150 m. N. N. W. of Boston, in lat. 44° 17' N., lon. 72° 36' W.; pop. in 1870, 3,023. It is built on a plain near the centre of the state, and is surrounded by a highly cultivated hilly country. The principal village is compactly built. The state house is a fine edifice of light-colored granite, erected at a cost of \$150,000 on the site of the former capitol, which was burned in 1857. It stands on a slight eminence, approached from a common by granite steps in terraces. It is built in



State Capitol, Montpelier.

the form of a cross, the main building being 72 ft. long and each of the wings 52 ft. The main building is 113 ft. deep, and 124 ft. high to the top of the dome, which is surmounted by a graceful statue of Ceres. The court house is also a fine structure. Montpelier has an active trade with the surrounding country, and contains several flour mills, saw mills, tanneries, an iron foundry, an extensive machine shop, and manufactories of sash and blinds, carriages, cabs and sleds, hats and caps, furniture, &c. There are two banks, three insurance companies, nine public and three private schools, four weekly newspapers (two of which publish a daily edition during the session of the legislature), and seven churches. The state library contains 14,690 volumes. The town is the seat of the Vermont Methodist seminary and female college, organized in 1869. A history of Montpelier by D. P. Thompson was published in 1860 (8vo, Montpelier).

MONTPELLIER, a city of Languedoc, France, capital of the department of Hérault, near the Lez, 27 m. S. W. of Nîmes, 17 m. N. E. of Cette, its port, and 76 m. W. N. W. of Marseilles; pop. in 1872, 57,727. It was once a place of military strength, but of its fortifications only the citadel remains. The town rises in the form of an amphitheatre along a slope, the summit of which, 168 ft. above the sea, is occupied by the place du Peyrou, a celebrated promenade. At the end of the promenade rises the *château d'eau*, which receives and distributes through the town the water conveyed from the opposite hill by an aqueduct of 53 large arches surmounted by 183 smaller ones, and 2,893 ft. long. The modernized cathedral contains an altarpiece, the "Fall of Simon Magus," by Sébastien Bourdon, a native of Montpellier. The medical school, formerly the bishop's palace, contains a library of 50,000 volumes, and portraits of the professors since 1289. The Musée Fabre, named after its founder, a Montpellier artist, contains a collection of paintings, the library of Alfieri, of 15,000 volumes, and some important manuscripts connected with the Stuarts, which belonged to Prince Charles Edward. The botanic garden, the first established in France, dates from the reign of Henry IV. In place of the former university, founded in 1176, and the medical school of which was celebrated, there are now three faculties, of medicine, sciences, and literature. There is also a high school of pharmacy, a lyceum, an episcopal seminary, a normal school, and several other special schools. Montpellier has manufactures of woollens, printed cottons, linens, silks, leather, straw goods, wax, and brandy; and it is particularly celebrated for its verdigris, made by oxidizing copper plates between layers of grape husks. There are also extensive manufactories of alum, Prussian blue, and sulphuric and nitric acid. It is the seat of a Catholic bishop, and of a Reformed consistory. The place is celebrated for the brightness of its atmosphere, and has been much frequented by invalids, but its salubrity is questioned.—In the 10th century Montpellier was a village N. of Maguelonne. Increasing as Maguelonne declined, it became a signiory, which passed in 1204 to the kings of Aragon, and in 1276 became part of the kingdom of Majorca. In 1349 it was ceded to France. Charles V. ceded it in 1365 to Charles the Bad of Navarre, but it returned to the crown under Charles VI. The episcopal see was transferred to Montpellier from Maguelonne about 1538. It suffered much during the religious wars, and was besieged and taken by Louis XIII. in 1622. The edict of Montpellier of Oct. 20, 1622, granted to the Calvinists freedom of worship, but forbade assemblies except of their synods and consistories, and granted them freedom from molestation only in La Rochelle and Montauban.

MONTPEISIER, Anne Marie Louise d'Orléans, duchess of, known as Mademoiselle, a French

princess, born in Paris, May 29, 1627, died there, March 5, 1693. She was the daughter of Gaston, duke of Orleans, brother of Louis XIII.; and being one of the richest heiresses in the world, her whole youth was passed in negotiations of marriage, which were defeated, as she declared, by the intrigues of Cardinal Mazarin. During the wars of the Fronde (1649-'52) she sided with the Frondeurs, and compensated by her boldness and capacity for the weakness and indecision of her father. In 1652 she volunteered to command the expedition sent to Orleans, forced her way into the city by one gate while the royalists were vainly seeking admission at another, and secured the adhesion of the authorities to the cause which she favored. Returning to Paris in time to assist Condé at the battle of the Porte St. Antoine, July 2, she caused the guns of the Bastille to be fired upon the royal troops, though she still did not despair of becoming the wife of the young Louis XIV. Banished after the reestablishment of Louis's authority in Paris, she employed her exile in the composition of her *Mémoires*, which were resumed in 1677, and continued till 1688. She finally returned to Paris in 1660, and lived in comparative retirement till 1669, when she fell in love with Lauzun, a poor Gascon noble six years younger than herself. The king gave his consent to the marriage, but was induced to revoke it and to commit Lauzun to the Bastille, where he was confined for ten years. It is said that a secret marriage had already taken place. Mademoiselle finally obtained his release by giving up two of her largest estates to the duke of Maine, the king's natural son by Mme. de Montespan, but Lauzun proved ungrateful and brutal. She forbade him her presence, and passed the rest of her life in devotional exercises. In the library of Paris are two manuscripts of her *Mémoires*, of which one is probably an autograph. The work was published at Amsterdam in 1746, in 8 vols. The edition by Chéruel (Paris, 1858) contains a collection of letters and various writings from her pen, including the *Relation de l'île imaginaire*, and the *Histoire de la princesse de Paphlagonie*.

MONTPEISIER, Antoine Marie Philippe Louis d'Orléans, duke de, a French prince, youngest son of Louis Philippe, born at Neuilly, July 31, 1824. He was educated at the collège Henri IV., became a lieutenant in the army in 1842, and fought in Algeria, where he was slightly wounded, in 1844. On Oct. 10, 1846, he married the sister of Isabella II. of Spain, an alliance which gave rise to serious complications, owing to the belief that it was intended by Louis Philippe to raise his son to the Spanish throne in view of the anticipated childlessness of Isabella, whose marriage with her cousin Francisco d'Assis was at the same time planned by the French king. He shared his father's exile in England in 1848, and subsequently resided at Seville. The titles of infante and

of captain general of the Spanish army were conferred upon him in 1859. In 1868 he left Spain for a time, and in 1870 was a candidate for the throne. The rival candidate, Don Enrique de Borbon, brother of Isabella's husband, having alluded to him in offensive terms, was challenged by Montpensier. They fought March 12, and at the third shot Enrique fell dead. The duke was sentenced by a court martial to one month's banishment and a fine of \$6,000. In 1871 he was exiled to Port Mahon for refusing to take the oath of allegiance to King Amadeus, but as a candidate to the cortes he was allowed to return to Madrid. He soon left for Paris, where he still resides. His elder daughter Isabella was married in 1864 to her cousin the count de Paris. In 1874 he lent his celebrated collection of Spanish paintings for exhibition in Boston.

MONTREAL, a city of the Dominion of Canada, in the province of Quebec, the largest in British North America, and the commercial capital of the country, in lat. $45^{\circ} 31' N.$, lon. $73^{\circ} 35' W.$, on the S. E. side of a triangular island of the same name at the confluence of the rivers Ottawa and St. Lawrence. This island, which is about 30 m. long by 10 m. in greatest breadth, is 600 m. from the mouth of the river, 140 m. in direct line S. W. of Quebec, 310 m. N. E. of Toronto, and 335 m. N. of New York. It stands at the head of ship navigation, and at the foot of that great chain of improved inland waters extending from the Lachine canal to the western shores of Lake Superior. In 1861 the population of Montreal was 90,323; in 1871, 107,225 (including 77,980 Roman Catholics and 29,245 Protestants), two thirds being of French origin. It derives its name from Mont Réal,



Montreal, from Mount Royal.

or Mount Royal, rising 750 ft. above the harbor, and covering at the base an area of about 8 sq. m. It is built mostly of a grayish limestone from adjacent quarries, and with its handsome spires and glittering tin roofs, and the picturesque villas that stud its lofty background, is seen to great advantage from the river. The Roman Catholic parish church, Notre Dame, in Place d'Armes, commenced in 1824 and opened in 1829, is built in Gothic style and in the form of a parallelogram. It is 241 ft. long, 135 ft. wide, and seats between 10,000 and 12,000. It has six towers, one at each corner and one in the middle of each flank. The two on the main front rise 213 ft., nearly twice the height of the others. In one of these is a peal of bells, the largest of which weighs upward of 20,000 lbs. The building comprises several aisles and chapel; it is 61 ft. from the founda-

tion to the eaves, and its principal window is 64 by 32 ft. It is at present (1875) the largest religious structure in the Dominion, but it will be surpassed by the Roman Catholic cathedral now in course of erection on the corner of Dorchester and Cemetery streets, after the plan of St. Peter's at Rome. The English cathedral, in St. Catharine street, is a most perfect specimen of Gothic architecture; it is cruciform, built of rough Montreal stone, with Caen stone facings. Its aisles are 112 ft. long with an aggregate width of 70 ft., and its transept is 100 by 25 ft. Its spire is 224 ft. high. In 1858 the number of churches in the city was 30; it is now 64, viz.: 9 church of England, 21 Roman Catholic, 5 Presbyterian, 5 church of Scotland, 5 Methodist, 4 Wesleyan, 4 Baptist, 2 Jewish, 2 Congregational, 1 French Evangelical, 1 German Protestant, 1 society

of Friends, 1 New Jerusalem, 1 Christian Advent, 1 Unitarian, and the St. George's Hall congregation. The principal benevolent institutions are the Hôtel-Dieu and St. Patrick's hospitals, attended by the sisters of St. Joseph, the Protestant house of industry and institution for deaf mutes, the infant school, *Providence Sacré Cœur*, the lying-in and Providence asylums, the dispensary, the eye and ear infirmary, the Protestant and the Catholic Magdalen and orphan asylums, the Catholic benefit society, and the charities under the immediate charge of the sisters of charity. First among the educational establishments is the university of McGill college, which embraces the largest school of medicine in British North America, a faculty of law, normal and model schools, a high school, and a chair of English literature. The collège de Ste. Marie is directed by the Jesuits, and the Montreal college by the Sulpicians, who have charge also of the *grand séminaire* and the ecclesiastical seminary at St. Sulpice. Besides these are the colleges of Ste. Thérèse and the Assomption. In 1873 there were 9 daily, 2 tri-weekly, 2 semi-weekly, and 17 weekly newspapers published in the city, with 9 monthlies and 3 semi-monthlies. The most important monetary establishments are the Montreal bank, founded in 1818, capital \$12,000,000; the Merchants' bank of Canada, \$6,000,000; bank of British North America, \$4,867,000; City bank, \$1,200,000; Banque du Peuple, \$1,600,000; and Molson's bank, \$1,000,000. Most of these have handsome edifices.—The principal business streets are St. James, McGill, Notre Dame, Commissioner, St. Paul, and the main thoroughfares of St. Lawrence, Quebec, St. Ann, St. Joseph, and St. Antoine suburbs. Most of the leading wholesale dry-goods and hardware houses are in St. Paul street. Of late years some of the narrow and tortuous streets have been widened, but many more remain in their original condition. The Bonsecours market, a fine Doric edifice, contains the city council chamber, corporation offices, and a concert room which seats 4,000 people. A more commodious market is projected, to cost \$2,000,000. The court house, built at an expense of \$300,000, is a lofty and spacious Ionic building about 120 ft. long. It contains a law library of 6,000 volumes. Back of it is the Champ de Mars, a fine military parade ground. In 1870, on the withdrawal of the British troops from Canada, this and all other imperial property in the city was presented to the Dominion government. In 1860 a crystal palace was opened for the exhibition of the products of the provinces. The merchants' exchange, in St. Sacrament street, is a handsome structure in the modern Italian style, with numerous offices and a reading room. The old government house, in Jacques Cartier square, and Nelson's monument, are objects of interest. The geological museum, the university of McGill college with its museum, and the museum of the natural history

society, are among the most complete institutions of the kind on the continent. The city is well lighted with gas, which was first used here in November, 1837. Water is obtained from the St. Lawrence, about $1\frac{1}{2}$ m. above the Lachine rapids, where the elevation of the river is about 37 ft. above the harbor. It is conducted to the outskirts of the city through an open canal 5 m. long. At the end of this is a wheel house, from which the water is discharged through submerged archways under covered frost-proof passages extending above and below the building. There are two iron wheels, which force the water 206 ft. above the harbor, through a pumping main $2\frac{1}{2}$ m. long, into a reservoir with a capacity of 15,000,000 gallons. The works, which cost about \$1,800,000, were begun in June, 1853, and water was admitted in September, 1856. The climate of Montreal is subject to great extremes, the summers being hot and the winters severe. The thermometer ranges from 90° above to 30° below zero.—In the beginning of the present century vessels of more than 300 tons could not approach the city. In 1809 the first steamer, the Accommodation, was launched on the river. About 1854 the Montreal ocean steamship company was formed. Its first vessels were employed in the transport service to the Crimea, and it was not till 1856 that they commenced the regular mail service, which was fortnightly till 1859, when it was made weekly. The harbor has been much improved of late years. Ocean steamships of 3,500 tons can now enter it, and a fine basin has been constructed, capable of accommodating three first class steamships. The river frontage is nearly 3 m. long, extending from the Victoria bridge to the village of Hochelaga. The wharves are more than a mile long, and of solid masonry, surmounted by a massive stone wall extending from the entrance of the Lachine canal to below the Bonsecours market. The Victoria bridge crosses the St. Lawrence from Point St. Charles at the head of the harbor to St. Lambert on the opposite shore, a distance of about 2 m. It was begun July 20, 1854, and completed in the autumn of 1859. (See BRIDGE, vol. iii., p. 275.) This bridge belongs to the Grand Trunk railway of Canada, and affords an unbroken line of communication with the United States. The custom house is massive and capacious, and has a fine tower. In 1855 the arrivals from sea were 188 vessels, of 47,394 tons, and the clearances 185, of 27,493 tons. The following tables show the business of the port for four years:

Shipping.

YEARS.	ENTERED.		CLEARED.	
	Vessels.	Tonnage.	Vessels.	Tonnage.
1870.....	840	228,121	410	243,167
1871.....	846	247,813	441	274,184
1872.....	435	811,567	497	328,538
1873.....	422	807,453	527	854,911

Commerce.

YEARS.	Imports.	Exports.
1870.....	\$25,680,814	\$19,100,413
1871.....	35,805,497	16,720,888
1872.....	40,088,665	18,171,884
1873.....	44,820,646	19,679,118

In the exports for 1873 are included 2,764,-643 bushels of wheat and 360,108 barrels of flour. The import duties collected in 1870 were \$4,128,052. The Lachine canal, $8\frac{1}{2}$ m. long, cuts across the S. point of the island, avoiding Lachine rapids. Since 1846 the waters of this canal and those skirting the river bank inside the upper basin have been turned to good account for manufacturing purposes. The principal manufactures are axes, saws, cordage, printing types, India-rubber shoes, chairs, paper, woollens, cotton bags, steam engines, nails, spikes, joiners' finishings, and flour. The Grand Trunk railway connects the city with Portland, Me., and the principal places in the Dominion; and the Vermont Central and Montreal and Province Line railways, with their connections, give it direct communication with New York and Boston. Its trade with St. John and Halifax is opened up through the Intercolonial railway.—Montreal is the metropolitan see of the church of England in Canada, and the seat of a Roman Catholic bishop. It is governed municipally by a mayor, 9 aldermen, and 18 councillors. The aggregate value of its real estate in 1856 was \$25,-565,333, and its total revenue from all sources \$285,032; in 1873 the value of real estate was \$63,561,150, and the total revenue \$907,-381.—The settlement of Montreal dates from 1535, when it was visited by Jacques Cartier, who named its mountain. The city was founded in 1642, on the site of the Indian village of Hochelaga. It was officially named Ville Marie, and for many years it was indifferently called by that and its present name. In 1758 it was well fortified. In 1760 it surrendered to the British; and it was captured by the Americans, under Gen. Montgomery, in November, 1775, and held until the next summer. In 1779 it contained 1,200 houses, 500 of which were of stone and within the walls, the remainder outside and mostly of wood. Several times it has suffered severely from fire. In 1765 108 houses were burned, and 215 families left destitute. The population was then about 7,000, and one fourth of the city, worth \$464,-000, was destroyed. In 1768 90 houses, two churches, and a large charity school were consumed. In 1849 the parliament buildings and library were burned by a mob, when the government was removed to Toronto. Montreal was the headquarters of the British army in Canada until the final withdrawal of the troops after the consolidation of the provinces into the Dominion.

MONTREUX, a commune of Switzerland, in the canton of Vaud and district of Vevey, cele-

brated for its salubrity and the beauty of its situation. It extends between ridges of the Col de Jaman and the E. extremity of the lake of Geneva, and consists of about 20 villages, with an aggregate population in 1870 of 4,731. The best known village is Clarens. The village of Montreux, near the castle of Chillon, on the lake and 40 m. N. E. of the city of Geneva, is the most frequented in winter, especially by sufferers from diseases of the heart. The mountains on the north protect it against cold and snow, and heavy frosts are unusual. Roses and violets bloom during almost the whole year. The grape cure begins early in September. The rate of mortality is said to be lighter in this locality than in any other part of the world.

MONTROSE, a seaport town of Forfarshire, Scotland, 23 m. N. E. of Dundee; pop. of the borough in 1871, 14,548; of the parish, 15,783. It is on the W. side of a sandy peninsula, having the sea on the east, the mouth of the South Esk river on the south, and on the west a shallow basin 3 m. long and 2 m. wide, which becomes dry at low tide. The harbor is one of the best on the E. coast of Scotland. Its mouth is narrow, but is marked by a lofty beacon on the S. and two lighthouses on the N. E. side, and admits vessels drawing 18 ft. There are quays and dry and wet docks. A chain suspension bridge 432 ft. long, built in 1829, connects the town with the suburb of the Inch across the South Esk. In the High street are statues of Sir Robert Peel and Joseph Hume, who was a native of the place. There are 14 churches, schools for which the town is celebrated, and two lunatic asylums. Between the town and the sea are the Links or downs, celebrated for races and golf matches. Near Montrose are the Montrose pits, a singular hollow in the sea, 30 fathoms deeper than the tract around, where cod are caught in great numbers. There are linen manufactories, employing about 4,000 persons, besides ship yards, iron founderies, and starch manufactories. In 1871 the imports were valued at £277,203, the exports at £21,216; the number of entrances was 133, tonnage 31,614; clearances 73, tonnage 16,334. The borough of Montrose received its first charter from David I., early in the 12th century. It was the seat of the first school of Greek in Scotland.

MONTROSE, James Graham, marquis of, a Scotch soldier, born at the family estate of Auld Montrose in the autumn of 1612, hanged at Edinburgh, May 21, 1650. At the age of 14, on the death of his father, he became fifth earl of Montrose. He was educated at the university of St. Andrews, and travelled abroad for some years. Being ill received by Charles I. when he visited the court after his return, he joined the Covenanters. His name was put upon the tables of committees for the popular cause, Nov. 15, 1637, and he was prominent in preparing the covenant. On the renewal of the contest in 1640, the earl led the vanguard of the Scotch infantry, but he soon

changed to the royalist side, and was imprisoned in Edinburgh castle by the Covenanters. After his release he remained for some time on his estates. In the spring of 1643 he joined Queen Henrietta Maria in England, but could not induce her to authorize energetic measures in Scotland, and returned home. The Covenanters vainly endeavored to win him back, and in the summer he again served with the king's army. Early in 1644 he was created marquis of Montrose, and appointed the king's lieutenant general in Scotland. Working on the hatred of many of the highland clans for the Campbells, he raised a force there, and was joined by some Irish infantry. He then commenced a series of brilliant operations, but circumstances prevented them from becoming useful to the king. On Sept. 1 he defeated the covenanting army under Lord Elcho at Tippermuir, and took Perth. On the 12th he destroyed another army in the battle of Aberdeen, and took that town. He ravaged Argyre's country, and defeated the Campbells at Inverlochy, Feb. 2, 1645. Receiving large accessions of force, he stormed Dundee, but abandoned it on the approach of the enemy. On May 8 he encountered Sir John Urrie at Auldearn, and won the most brilliant of his victories. The victory of Alford was won July 2, over Gen. Baillie; whom he again met and conquered at Kilsyth, Aug. 15. But the highlanders formed an unstable force, and Montrose found himself almost without men when he marched to the border. On the morning of Sept. 13 he was surprised at Philiphaugh by David Lesley, and his army routed. In July, 1646, he capitulated to Middleton, and on Sept. 3 he sailed for the continent. He was made an Austrian marshal, and authorized to raise regiments for Charles I. After the death of that monarch, Charles II. renewed his commission. Having received some arms and subsidies from Denmark, Sweden, Holstein, and Hamburg, he landed in the Orkneys early in 1650, and proceeded thence to Scotland at the head of an ill-organized force of 1,500 men, but was speedily defeated and made prisoner. Sentences of excommunication and forfeiture had been passed upon him by the general assembly in 1644. He was executed with every species of indignity. His head was placed on the Tolbooth, and his limbs were sent to various parts of Scotland. After the restoration Charles II. reversed the sentence of forfeiture, and his remains were buried in state in St. Giles's cathedral.—See "Montrose and the Covenanters," by Mark Napier (2 vols. 8vo, London, 1838), and Grant's "Memoirs of the Marquis of Montrose" (Edinburgh, 1857).

MONTSERRAT, or **Monseratt**, one of the smallest of the British West India islands, belonging to the Leeward group, nearly equidistant, or about 30 m., from the islands of Nevis, Antigua, and Guadeloupe; lat. of the N. point, 16° 50' N., lon. 62° 20' W.; area, 47 sq. m.; pop.

in 1871, 8,693, of whom scarcely more than 150 were white. About two thirds of the island is mountainous and barren, but the remainder, at the base of the mountain slopes, is fruitful and well watered. The soil is of a light volcanic description. The principal crop is sugar, the export of which in 1870 was 3,382,200 lbs.; in 1871, 3,403,800 lbs.; and in 1872, 2,773,800 lbs. The E. side of the island is mostly uncultivated, covered with high mountains producing cedar and other useful and valuable trees; on the W. side the land slopes toward the sea. The climate is healthy. In 1872 the value of the imports from the United Kingdom was £27,677, and of the exports to it £29,736. The trade is mainly with other British West India islands. The chief town is Plymouth, on the S. W. coast; it is small, but neat, and the houses are well built of fine gray stone. The government is administered by a president, under the governor-in-chief of the Leeward group, assisted by an executive council and a representative assembly.—This island was discovered by Columbus in 1493. In 1632 a party of Irish Roman Catholics from a neighboring island settled on it; and after a French invasion in 1664 it was restored to Britain by the treaty of Breda on July 20, 1667. It was again seized by the French in 1782, and finally made over to England by the treaty of Versailles, Sept. 3, 1783. On March 30, 1872, Montserrat, Antigua, St. Christopher, Nevis, the Virgin Islands, and Dominica were constituted a single colony under one governor-in-chief. Previously the island had a separate government, consisting of a lieutenant governor or president, and a single chamber styled the legislative council.

MONTSERRAT, a mountain of Spain. See **MONSERATT**.

MONTUCLA, Jean Étienne, a French mathematician, born in Lyons, Sept. 5, 1725, died in Versailles, Dec. 18, 1799. After studying at the Jesuits' college of Lyons and the law school of Toulouse, he went to Paris, where he became connected with the *Gazette de France*. In 1761 he was appointed intendant-secretary at Grenoble, and in 1764 he accompanied the chevalier Turgot as first secretary and astronomer of his colonizing expedition to Cayenne. On returning to France, he became commissioner of the royal buildings, and afterward royal censor. The former office he held for 25 years, till the revolution deprived him of it. He received a pension of 2,400 francs only a few months before his death. He was a member of the institute from its foundation, and in 1755 became a member of the academy of Berlin. He published anonymously *Histoire des recherches sur la quadrature du cercle* (1754; new ed., 1831), and was the author of numerous other works, the principal of which was *Histoire des mathématiques* (2 vols., Paris, 1758; completed by Lalande, 1802).

MONTYON, or **Monthyon**, **Antoine Jean Baptiste Robert Augé**, baron de, a French philanthropist,

born in Paris, Dec. 23 or 26, 1733, died there, Dec. 29, 1820. He was successively intendant of the provinces of Provence, Auvergne, and Anis. As member of the royal council he protested against the dissolution of ancient parliaments decreed by Chancellor Maupeou, and was deprived of his office. Soon after the accession of Louis XVI. he was appointed councillor of state, became in 1780 chancellor of the count d'Artois (afterward Charles X.), emigrated to England on the breaking out of the revolution, and did not return until the second restoration. He possessed a princely fortune, and devoted the larger portion to philanthropic purposes, founding prizes, assisting his exiled countrymen, and bequeathing to French hospitals over 8,000,000 francs. Every year the French academy distributes two Montyon prizes on a foundation of 10,000 francs each: one to the poor person who has performed the most meritorious deed of virtue; the other to the author of the work most useful for the improvement of public morals. Two others of equal amount are awarded by the academy of sciences: one to him who shall have found during the year some improvement of the medical and surgical art; the other to him who shall have discovered the means of rendering some mechanical art less unhealthy. Montyon published an *Éloge du chancelier de l'Hôpital* (Paris, 1777); *Recherches et considérations sur la population de la France* (1778); an essay on the influence of the discovery of America upon Europe, which won a prize at the French academy; *Quelle influence ont les diverses espèces d'impôts sur la moralité, l'activité et l'industrie des peuples?* (1808); and some other writings.

MONZA, a city of Italy, in Lombardy, on the river Lambro, which divides it into almost equal parts, 9 m. N. E. of Milan; pop. about 16,000. Monza was once walled and defended by a castle; the walls are now levelled. The most important building is the cathedral, founded by Queen Theodelinda in 595, and reconstructed in the 13th and 14th centuries. It contains many relics of the Lombard kingdom, of which Monza was the capital. The most celebrated relic is the iron crown which was used for the coronation of the kings of Lombardy and the emperors who subsequently claimed that title. It is mainly of gold, and takes its name from a thin band of iron, said to have been hammered from a nail of the true cross. Napoleon I. was the first who wore it after the emperor Charles V. It was carried off by the Austrians in 1859, but was returned in 1866. The palace of Monza is surrounded by a celebrated park.

MOODY, a S. E. county of Dakota, bordering on Minnesota, recently formed, and not included in the census of 1870; area, 528 sq. m. It is intersected by the Big Sioux river, and lies partly on the Plateau du Coteau des Prairies.

MOOLTAN, or *Multan*, a city of British India, in the Punjab, 193 m. S. W. of Lahore, with which it is connected by railway, and 3 m. from

the left bank of the river Chenaub; pop. about 60,000. It is 3 m. in circumference, and has lofty houses but narrow streets, and the numerous bazaars and shops are also narrow. It is overlooked on the north by a fortress, whose walls, which are 40 ft. high on the out-



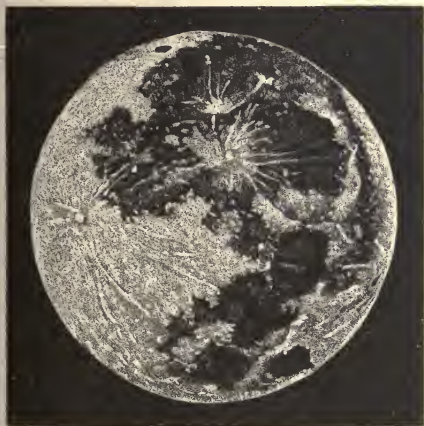
Tomb of Rookum Alum, Mooltan.

side, have 30 towers. In one of the angles of its interior is a large pagoda, supposed to be 1,000 years old, containing the graves of Rookum Alum and many of his descendants. The local and foreign trade is extensive. The staple manufactures are silks, cottons, shawls, longees, brocades, and tissues. In the vicinity are extensive fruit gardens, and many ruins of tombs and of religious edifices. It is one of the most ancient cities of Hindostan. The English gained possession of it in 1849, after expelling the Sikhs.

MOON, the satellite of the earth, the nearest of the heavenly bodies to us. It is an opaque spheroid 2,159.8 m. in diameter, shining by reflecting the light of the sun. Situated at an average distance of 238,818 m., the moon revolves about the earth in 27.32166 days, this being her mean sidereal revolution. To this motion are due her monthly phases. The course of these, however, is only completed in a lunar month, or synodical revolution, the mean length of which amounts to 29.53059 days. For the phases depend on the moon's position with respect to the sun, which is constantly advancing in the direction of her motion; so that, after completing 360° of her orbit, she has the whole amount of the sun's monthly progress, which is an arc of about 29°, to pass over before she can complete her course of phases.

The former period is sometimes called the sidereal month, the latter the synodic month. When not eclipsed, she always presents to the sun an illuminated hemisphere; her phases depend on the amount of that hemisphere turned toward the earth. If the earth is directly between her and the sun, we see all of it; if she is between us and the sun, we see none of it; if she is midway between these positions, we see half of it. In the first position, she is said to be in opposition; in the second, in conjunction; in the third, in quadrature, or quarter; and her phases, in order, are known familiarly as new, crescent, half-moon, gibbous, and full.—From the constancy of the physical features of the moon's disk, it is evident that she always presents to us the same hemisphere. To do this she must turn upon her axis precisely once while making one revolution in her orbit. This appears to be the general law of the motions of the satellites. But it is not quite accurate to say that the moon constantly presents the same hemisphere to every observer upon the earth. Her axis of rotation being inclined one degree and a half to her orbit, and maintaining the same general direction in space as she moves round the earth, she appears to nod backward and forward in an arc of about 13° in the course of every revolution, exposing to view the regions just beyond her N. and S. poles alternately. Nor is

constancy of the direction of her hither hemisphere is to be referred to the earth's centre, so that the observer, situated upon the extremity of the earth's radius, views her from an elevation of nearly 4,000 m.; and when she is in the horizon it is plain he can look over her elevated edge, as it were. The oscillation thus occasioned is much smaller than either of the others, amounting only to about 2° . These several exposures are called the moon's librations: the first her libration in latitude; the second her libration in longitude; the third her diurnal libration. The absolute maximum librations from the moon's mean position are as follows: libration in latitude, $6^\circ 44'$; in longitude, $7^\circ 45'$; diurnal, $1^\circ 13'$. If the whole surface of the moon be regarded as equal to 10,000, then instead of seeing only 5,000 parts, as we should do if there were no libration, our range of view extends over 5,802 parts without taking the diurnal libration into account, and over 5,889 parts if diurnal libration be considered. So that only 4,111 parts of the moon out of 10,000 remain absolutely concealed from human ken.—To the casual observer the motions of the moon in different seasons of the year seem exceedingly irregular. She is sometimes seen, at the full, coursing along a circle which passes near the zenith in these latitudes, and sometimes, in the same phase, along an arc low down in the southern sky. It is plain that this is mainly owing to the inclination of the earth's equator to the ecliptic; but there is a large residual effect which is due to the inclination of the moon's orbit to the plane of the ecliptic, amounting to $5^\circ 8'$, so that during one half of her orbit she is south of the sun's annual path, and during the remaining half north of it. The points where she crosses the ecliptic are known as her nodes; that at which she passes from the southern to the northern side of the line is called her ascending node, the other her descending node. If the ecliptic were a line of light ever conspicuous in the sky, and the moon's path intersecting it also a conspicuous line of light, the place of crossing would be seen to be different every month, being removed further and further to the westward at intervals of about three diameters of the moon. This at least is the average rate of the motion; for the motion is not only not uniform, but is at times reversed. It is known as the retrograde motion of the nodes; the period of completing the whole circuit of the ecliptic is 18.5997 years. The orbit of the moon being an ellipse, having the earth at one of its foci, her distance varies in different parts of her monthly course. The nearest point of her orbit is called perigee, the furthest apogee; the two are known as apsides. These points are not fixed, but move forward (on the whole) from west to east, occupying successively every position in the circumference of the ellipse in the course of 8.8505 years. These two remarkable motions, viz., of the nodes and



Full Moon, from Photographs taken by Prof. H. Draper, New York.

this all. As the moon's orbit, like that of every other planetary body, is an ellipse, her orbital velocity is not uniform, being most rapid when she is nearest the earth. Thus she sometimes gets ahead of her mean place, and sometimes lags behind it; and as her axial rotation is absolutely uniform, we are enabled to look over her edge, so to speak, now on the eastern and now on the western side. The arc through which she oscillates in this way amounts to more than 15° . And again, the

of the apses, are due to the disturbing action of the sun.—The moon's surface has no obvious indications of water, nor of an atmosphere. Mr. C. B. Boyle of New York, however, who has long made a special study of the moon, maintains that she has a slight atmosphere, and that she has also water in the shape of numerous small ponds, which for optical reasons are not always visible through the telescope, but have occasionally been noticed by astronomers as bright sparkling points. Schröter (about 1800) claimed to have discovered indications of vegetation on the surface of the moon. These consist of certain traces of a greenish tint which appear and reappear periodically; much as the white spots covering the polar regions of Mars, supposed to be snow and ice, are observed to increase in the winter and waste in the summer of those regions of the planet. As we are able, under the most favorable conditions, to use upon the moon telescopic powers which have the effect of bringing the satellite to within 150 to 120 m. of us, we should doubtless notice any such marked changes on her surface as the passage of the seasons produces, for example, on our own globe. In the most powerful instruments yet constructed the surface of the moon presents a scene of wildest desolation. In every direction are circular caverns or pits, many of enormous size; the floor of one is seen to be strewn with huge blocks. The inner walls are commonly steep, and their depth often frightful, being many thousand feet. They are surrounded by annular ridges, the masses of which would exactly fill the enclosed cavities. In the centre commonly rises a conical mountain. All



Moon at the First Quarter, from Photographs taken by Prof. H. Draper, New York.

this plainly points to a volcanic origin. There are large regions perfectly level, which Sir John Herschel considered to be of a decided alluvial character. There are great rings of mountains enclosing areas of 40 to 120 m. in diameter. From these ranges shoot up stupendous peaks,

one to the height of 16,000 ft. Isolated peaks here and there rise abruptly from extended plains to the height of 6,000 to 7,000 ft. These elevations are determined by calculations based on the height of the sun above the horizon of the lunar place under inspection, and the length of the shadows cast. The most favorable time for observing these remarkable features is when the moon is about half full. Beyond the illuminated hemisphere mountain peaks, rising miles above the average level of the surface, are then bathed in sunlight, while the intermediate space is veiled in darkness. Thus the peaks are at such a time seen as silver points detached from the bright crescent; or, if they form a chain stretching toward the rising sun, they may appear as ragged promontories of light jutting far out into the darkness. An admirable chart of the moon has been constructed by the eminent Prussian observers, Beer and Mädler, whose work, *Der Mond*, must be consulted for a full account of the physical condition of our satellite. They place the height of one mountain at 23,823 ft. This, considering the relative magnitudes of the moon and the earth, is far more stupendous than any known elevation of terrestrial surface. More recently Schmidt of Athens, Greece, has made an elaborate series of observations, extending over the years 1839-'72. The diameter of the chart constructed from these observations is to be six Paris feet, and it is to be published in 25 sections. The application of photography to the moon, though it has not yet resulted in giving maps comparable in accuracy of detail with those by Beer and Mädler, and by Schmidt, has yet given pictures of extreme value and interest. In 1840 Dr. J. W. Draper of New York first succeeded in photographing the moon. With a telescope 5 in. in aperture he obtained pictures on silver plates, and presented them to the lyceum of natural history of New York. Bond of Cambridge, Mass., made photographic pictures 2 in. in diameter with the refractor of the Harvard observatory in 1850. Since then, Secchi in Rome, Bertch and Arnauld in France, and Phillips, Hartnup, Crookes, De la Rue, and others in England, have made lunar photographs, some of those by De la Rue being admirable. Dr. H. Draper and Mr. Rutherford of New York have taken some of the finest photographic views yet produced. To one of the photographs by Rutherford (taken Feb. 27, 1871) De la Rue ascribes the palm of absolute superiority among all the lunar photographs yet taken.—The mass of the moon is not accurately known, though the most trustworthy determinations agree in placing it at about $\frac{1}{81}$ part of the mass of the earth. The mass of the moon is intimately associated with her distance and motions. It is best determined from the nutation of the earth's axis (see NUTATION), and when determined must be added to the earth's mass in calculating the deflecting action of the mutual gravitation of the earth

and moon, a reduction being made for the sun's perturbing influence. As the actual deflection is known, and can therefore be compared with the result thus theoretically determined, we have a means of testing the various determinations of the moon's distance. Prof. Colbert of Chicago considers that the lunar elements deduced balance each other most satisfactorily if we take the following values: mean equatorial horizontal parallax, $57' 0.67''$; mean distance in miles, 238,973; mass of moon to earth's as 1 to 81.38; and thence he deduces: diameter of moon, 2,160.35 m.; volume of moon to earth's as 1 to 49.2; density, earth's as 1, 0.6044; distance of centre of orbit from the earth's centre, 13,121.5 m.; mean distance of centre of gravity of earth and moon from the earth's centre, 2,900.86 m. It may be remarked, however, that the various elements dealt with are not as yet determined so exactly that very much reliance can be placed on the method of testing here indicated. It is to be noted, in passing, that the term lunar parallax as commonly used is applied (not quite correctly, however) in such a way that the earth's radius, instead of being to the distance as cosecant of the parallax, bears to it the ratio, arc : radius. (See Chauvenet's "Astronomy.") The faint apparition of the entire lunar disk at the time of new moon is considered to be due to the reflection of the light received from the earth, whose illuminated hemisphere is then turned toward her.

MOORCROFT, William, an English traveller, born in Lancashire about 1780, died at Andkhui, between Bokhara and Cabool, Aug. 27, 1825. He was a veterinary surgeon, and went to India in 1808 as superintendent of the East India company's stud in Bengal. With the view of introducing stallions from the neighborhood of Balkh and Bokhara, and at the same time of establishing commercial intercourse with the trans-Himalayan districts, he travelled beyond the Himalaya in 1812 and 1819, pursuing a route in which no European had preceded him, determining the sources of some of the rivers of Punjaub, and visiting Ladakh, Serinagur, Cabool, and Bokhara. He purchased several valuable horses, with which he set out on his return in the summer of 1825, but died of fever, under suspicious circumstances. An account of his explorations up to his arrival at Bokhara was published by Prof. H. H. Wilson, "Travels in the Himalayan Provinces of Hindustan and the Punjab, in Ladakh and Kashmir," &c. (London, 1841).

MOORE, I. A central county of North Carolina, drained by Deep, Little, and Lumber rivers; area, about 700 sq. m.; pop. in 1870, 12,040, of whom 3,019 were colored. It has a diversified surface, and the soil is fertile near the streams. The Western railroad of North Carolina passes through it. The chief productions in 1870 were 56,328 bushels of wheat, 170,450 of Indian corn, 45,545 of oats, 52,906 of sweet potatoes, 21,751 lbs. of tobacco, 14,209 of wool,

68,072 of butter, and 930 bales of cotton. There were 1,435 horses, 644 mules and asses, 3,616 milch cows, 5,508 other cattle, 10,072 sheep, and 15,125 swine. Capital, Carthage. **II.** A S. county of middle Tennessee, bounded S. by Elk river; area, about 160 sq. m. It was formed in 1872 from portions of Franklin and Lincoln counties. The surface is diversified and the soil generally fertile. Capital, Lynchburg.

MOORE, Alfred, an American jurist, great-grandson of Sir Nathaniel Moore, governor of Carolina in 1705, born in Brunswick co., N. C., May 21, 1755, died at Belfont, N. C., Oct. 15, 1810. At the age of 20 he became captain in a regiment of North Carolina troops, commanded by his uncle Col. James Moore. He subsequently resigned, but when the British seized Wilmington, he raised a troop of volunteers, with whom he rendered great service to the American cause. The war left him penniless, and the general assembly in 1790 made him attorney general; and though he had not yet mastered the first rudiments of law, he soon attained by hard study a foremost rank in his profession, was raised to the bench in 1798, and became associate justice of the supreme court of the United States in 1799. He resigned in 1805.

MOORE, I. Benjamin, an American bishop, born in Newtown, L. I., Oct. 5, 1748, died at Greenwich, Conn., Feb. 27, 1816. He graduated at King's (now Columbia) college in 1768, was ordained in England as a minister of the Episcopal church in 1774, became an assistant minister of Trinity church in New York, and succeeded to the rectorship in 1800. On Sept. 11, 1801, he was consecrated bishop of the state of New York, as successor of Bishop Provoost. He was also president of Columbia college. In February, 1811, he was attacked by paralysis, which rendered him incapable of further active duty. A collection of Bishop Moore's sermons (2 vols. 8vo, New York) was published after his death by his son Clement C. Moore. **II. Clement Clarke**, an American scholar, son of the preceding, born in New York, July 15, 1779, died in Newport, R. I., July 10, 1863. He graduated at Columbia college in 1798, and in December, 1821, was appointed professor of Hebrew and Greek literature, and afterward of oriental and Greek literature, in the Protestant Episcopal seminary in New York. To this institution he gave from his family inheritance the large plot of ground on which it stands. He retired in June, 1850. Dr. Moore published a Hebrew and English lexicon (New York, 1809); a collection of "Poems," the best known of which is the "Visit from St. Nicholas" (1844); and "George Castriot, surnamed Scanderbeg, King of Albania" (1850).

MOORE, Edward, an English poet, born in Abingdon, Berkshire, Aug. 22, 1712, died in London, Feb. 28, 1757. His first poetical work, entitled "Fables for the Female Sex," appeared in 1744. In 1750 he married Miss Hamilton, who secured a place in the royal household.

In 1751 he became editor of "The World," in which his own articles appeared under the pseudonym of Adam Fitz Adam. He was the author of two comedies, both of which failed. His tragedy of "The Gamester" (1753) achieved popularity, and is still performed.

MOORE, Henry, an Irish clergyman, born in Dublin in 1751, died in 1843. Under the preaching of the Wesleys he united with the Methodists, was admitted to probation in 1779, labored several years in Ireland, and then became John Wesley's confidential counsellor. He was successful as a revivalist, and founded numerous chapels. After the death of Wesley he was prominent in the discussion as to a church government, advocating the episcopal form. He also defended the itinerant system and the right of Wesleyan ministers to administer the sacraments. He was the last survivor of those whom Wesley had ordained. His principal works are: "Life of the Rev. John Wesley, A. M., including the Life of his Brother the Rev. Charles Wesley, and Memoirs of their Family" (1824), and "Memoir of Mary Fletcher."

MOORE, I. Jacob Bailey, an American author, born in Andover, N. H., Oct. 31, 1797, died at Bellows Falls, Vt., Sept. 1, 1853. In early life he was a printer at Concord, N. H., in partnership with his brother-in-law Isaac Hill, and in 1823 he became a bookseller and publisher. With the assistance of John Farmer he edited and published "Collections, Topographical, Historical, and Biographical, relating principally to New Hampshire" (3 vols., 1822-4). From 1826 to 1829 he edited the "New Hampshire Journal;" he was sheriff of Merrimack county from 1829 to 1834; and in 1839 he edited the New York "Daily Whig." For four years he was a government clerk at Washington; then he became librarian of the New York historical society, and from 1849 to 1853 he was postmaster of San Francisco. His other principal works are: "Annals of the Town of Concord," with a memoir of the Penacook Indians (1824); "Laws of Trade in the United States" (1840); and "Memoirs of American Governors" (1846). The last named work, left incomplete, was designed to embrace all the colonial and provincial governors to the revolution. **II. George Henry**, an American author, son of the preceding, born in Concord, N. H., April 20, 1823. He went to New York in 1839, and became assistant librarian of the historical society in 1841 and librarian in 1849, which office he still holds (1875). He has published "The Treason of Charles Lee" (1860), "Employment of Negroes in the Revolutionary Army" (1862), "Notes on the History of Slavery in Massachusetts" (1866), and "History of the Jurisprudence of New York." The university of New York has conferred upon him the degree of LL. D. **III. Frank**, an American editor, brother of the preceding, born in Concord, N. H., Dec. 17, 1828. He was secretary of legation at Paris in 1869-72. His principal work is "The Rebellion Record"

(12 vols. 8vo, 1861-'71). He has also edited "Songs and Ballads of the American Revolution" (1856), "Diary of the American Revolution" (2 vols. 8vo, 1860), "Lyrics of Loyalty" and "Rebel Rhymes and Rhapsodies" (1864), and other works.

MOORE, John, a Scottish author, born in Stirling in 1729, died at Richmond, near London, Feb. 28, 1802. He graduated at Glasgow, travelled extensively on the continent, chiefly as a private tutor, and afterward practised medicine in London. He wrote "A View of Society and Manners in France, Switzerland, and Germany" (London, 1779), of which several editions and numerous translations were published within ten years; "A View of Society and Manners in Italy" (1781); and "Zeluco," a novel (1789). A uniform edition of his writings, with a memoir, was prepared by Dr. Robert Anderson (7 vols. 8vo, Edinburgh, 1820).

MOORE, Sir John, a British general, eldest son of the preceding, born in Glasgow, Nov. 13, 1761, fell in battle at Corunna, Spain, Jan. 16, 1809. He was educated chiefly on the continent while his father was travelling with the duke of Hamilton. He received a commission in the army in 1776, and served in Minorca and afterward in America till 1783, when his regiment was disbanded. He held a seat in parliament for a short time. In 1787 he was made a major, and in 1790 he became lieutenant colonel of his regiment, which he accompanied in 1793 to Gibraltar. In 1794 he was sent to Corsica, where he distinguished himself and was wounded. He was made brigadier general in 1795, and in 1796 took part in the capture of the island of St. Lucia, West Indies, of which he was made governor. He completely subdued the bands of insurgent negroes, but ill health obliged him to return home in 1797. During the Irish rebellion of 1798 he served on the staff of Sir Ralph Abercromby, and was promoted to the rank of major general. In June, 1799, he accompanied the duke of York on his disastrous expedition to Holland, and was severely wounded. In the Egyptian expedition in 1801 he received a sabre wound in the chest and a bullet in the thigh. On the surrender of Alexandria he returned to England and was knighted. He afterward went to Sicily, and thence, in May, 1808, at the head of about 10,000 men, to Sweden to assist in the defence of that country against Napoleon. He had difficulty with Gustavus Adolphus IV., returned with his troops to England, and was sent to Portugal, where, after the expulsion of the French, he was appointed to the command of the army intended to cooperate with the Spanish forces in the peninsula. He advanced from Lisbon in October, 1808, but discovered that the patriotic zeal which had been expected did not exist, and the Spanish forces were defeated at all points. He lingered awhile at Salamanca; but Napoleon at the head of a large force, supported by the whole of the French armies in the peninsula,

was advancing to surround him. His retreat, which began Dec. 11, was through a mountainous and dreary region. The British rear guard quitted Astorga Dec. 31, and, having three times checked their pursuers, joined the main army at Lugo, where for two days battle was offered to Soult by Moore, but not accepted. The retreat commenced afresh, and they reached Corunna Jan. 11, 1809, and five days afterward repulsed the enemy in the battle in which their commander fell by a cannon shot. (See CORUNNA.) Soult caused a monument to be erected to his memory, which is also preserved in the well known lines written upon his burial by Charles Wolfe. The British parliament had a monument erected to him in St. Paul's cathedral; and his native city raised a bronze statue to his memory at a cost of £3,000.

MOORE, Nathaniel F., an American scholar, born in Newtown, L. I., Dec. 25, 1782, died near New York, April 27, 1872. He was a nephew of Bishop Benjamin Moore, graduated at Columbia college, New York, in 1802, and was admitted to the bar in 1805. He was appointed in 1817 adjunct professor and in 1820 professor of the Greek and Latin languages in Columbia college, retaining his chair till 1835, when he visited Europe. In 1837 he was appointed librarian of the college, and in 1842 he succeeded Judge Duer in the presidency, from which he retired in 1849. He published "Ancient Mineralogy" (New York, 1834; new ed., 1859); "Remarks on the Pronunciation of the Greek Language," in reply to a pamphlet by Mr. Pickering; "Lectures on the Greek Language and Literature;" and a "Historical Sketch of Columbia College."

MOORE, Richard Channing, an American bishop, born in New York, Aug. 21, 1762, died in Lynchburg, Va., Nov. 11, 1841. He was educated in Columbia college, and studied medicine, but in July, 1787, was ordained a deacon of the Protestant Episcopal church by Bishop Provoost of New York, being the first Episcopal minister who received orders in that state. He was rector of a parish embracing the whole of Staten Island from 1789 to 1809, and afterward of St. Stephen's church, New York. In 1814 he was elected to succeed Bishop Madison as bishop of Virginia, and was till his death also rector of the Monumental church in Richmond. The prosperity of the church in the diocese was greatly increased by his unremitting efforts. He was a prominent leader of the evangelical branch of the church. In 1829 Bishop Meade was appointed his assistant.

MOORE, Thomas, an Irish poet, born in Dublin, May 28, 1779, died at Sloperton cottage, Devizes, Wiltshire, Feb. 25, 1852. By his father, John Moore, a grocer, he was brought up in the Roman Catholic faith; and at school he acquired a taste for music, recitation, and dramatic performances. As early as 1793 he became a contributor of short poems to the "Anthologia Hibernica," a Dublin magazine. He graduated at Trinity college, Dublin, in

1798, and in 1799 went to London to study law in the Middle Temple, carrying with him a translation of the odes of Anacreon commenced in his school days, which he published by subscription (1800). It proved successful; and gaining the acquaintance of the earl of Moira, he was introduced to some of the fashionable circles of the metropolis. In 1801 he published "The Poetical Works of the late Thomas Little, Esq.," a pseudonyme suggested by his diminutive stature. With much that was polished, tender, and natural, the volume contained many pieces of questionable morality, which were afterward excluded from the collected edition of his poems. In 1803 he was appointed registrar to the admiralty in Bermuda, where he arrived in January, 1804. The office was neither lucrative nor adapted to his tastes; and intrusting his business to a deputy, he returned to England, having first made a rapid tour through a portion of the United States and Canada. His "Odes and Epistles" (1806) presented a series of poetical notes of his progress and comments upon American institutions and literature. This volume was severely handled by Jeffrey in an article in the "Edinburgh Review." Moore challenged the reviewer, and a meeting took place, which was interrupted by the police before a shot had been fired. It was subsequently discovered that one of the pistols had no bullet, and Byron, in his "English Bards and Scotch Reviewers," made a ludicrous allusion to "Little's leadless pistol," for which he was called to account by Moore. A second duel was however avoided, and thenceforth Moore was on terms of warm friendship with both Jeffrey and Byron. In 1811 he married Miss Bessie Dyke, a young actress, and adopted literature as a profession. Having tried his hand at serious satire in his "Corruption," "Intolerance," and the "Sceptic" (1808-'9), he attempted *jeux d'esprit* and political squibs, writing among others the "Twopenny Post-Bag" (1812), which like most of his similar pieces was in the interest of the whig party. In July, 1813, he was established at Mayfield cottage, near Ashbourne in Derbyshire. Here were written many of the songs adapted to the ancient music of his native country, known as "Irish Melodies" (1807-'34). They were commenced at the suggestion of Mr. Power, a music publisher, and were extended to ten series. For the arrangement of the melodies he was indebted to Sir John Stevenson. These songs have enjoyed a popularity beyond that of any similar poems in the English language. He also published two series of "Sacred Melodies" (1816), six series of "National Airs" (1819-'28), "Legendary Ballads" (1830), and many miscellaneous pieces, the airs and arrangements for which were prepared by Sir John Stevenson or himself. In the latter part of 1814 Moore agreed to furnish the Messrs. Longman with a poem of the same length as Scott's "Rokeby," for which he was paid £3,000. The idea of writing an oriental ro-

mance had occurred to him several years previous, and at the time of making the contract much of the preliminary reading and a portion of the poem were already completed. Two more years of labor produced his "Lalla Rookh," the most elaborate of his works (1817), a series of four eastern stories, connected by a thread of prose. This poem has passed through numberless editions, and has been translated into Persian. After its publication the poet accompanied Rogers to Paris, where he obtained the materials for his "Fudge Family in Paris" (1818), which was succeeded in 1819 by "Tom Crib's Memorial to Congress." About this time, at the request of the marquis of Lansdowne, he took up his residence at Sloperton cottage, near Bowood, Wiltshire, the seat of that nobleman. Having become involved, through his agent in Bermuda, in liabilities amounting to £6,000, in September, 1819, he went to Paris to avoid arrest, declining many offers of assistance. Soon after he accompanied Lord John Russell to Italy, and visited Byron at Venice. His impressions of travel were recorded in his "Rhymes on the Road," published with the "Fables for the Holy Alliance" in 1823. Establishing himself in Paris in 1820, he sent for his family and resumed his literary pursuits. In 1822, after negotiation, the claim against him was reduced to 1,000 guineas, toward the discharge of which the uncle of his agent contributed £300, while the marquis of Lansdowne lent Moore the balance; and he returned to Wiltshire. His "Loves of the Angels" appeared in 1823, the "Life of Sheridan" in 1825, and "The Epicurean," a prose fiction, in 1829. His most important prose work was his "Notices of the Life of Lord Byron" (2 vols. 4to, 1830), founded on the journals and memorandum books of the poet, and a mass of correspondence furnished by the publisher Murray and others. Ten years before Byron had intrusted to Moore an autobiography extending to 1820, to be published after his death, which Moore in 1821 disposed of to Murray for £2,000. The sudden death of Byron in 1824 revealed the existence and projected publication of this manuscript, and Moore was persuaded into an arrangement by which it was repurchased from Murray and burned, on the ground that it contained disclosures affecting the character of many persons, living and dead. The objectionable passages, according to Lord John Russell, did not exceed three or four pages. With such materials as were subsequently procured he compiled a biography, for which he received from Murray £4,870. His remaining works comprise "The Summer Fête" (1831), a poem; "Memoirs of Lord Edward Fitzgerald" (1831); "Travels of an Irish Gentleman in Search of a Religion" (1833); and the "History of Ireland" (4 vols. 12mo, 1835), written for Lardner's "Cabinet Cyclopaedia." He wrote little else beyond an occasional trifle in verse for the periodicals, and the prefaces and a few addi-

tions to a collected edition of his poetical works, published by the Longmans in 1840-'41, in 10 vols. His latter years were clouded by domestic grief, his children having all died before him, and by mental imbecility caused by softening of the brain. In 1835 a literary pension of £300 was conferred upon him. His "Memoirs, Journal, and Correspondence" were sold for £3,000 to the Longmans, who published them in 8 vols. (1852-'6), under the editorial supervision of Lord John Russell, in accordance with the testamentary desire of the poet. The journal embraces the period between 1818 and 1847.

MOORE, Zephaniah Swift, an American clergyman, born in Palmer, Mass., Nov. 20, 1770, died June 30, 1823. He graduated at Dartmouth college in 1793, was principal of the Londonderry academy in 1793-'4, entered the ministry, and preached at Leicester from 1798 to 1811, when he was appointed professor of languages in Dartmouth college. He was chosen president of Williams college in 1815, but failing to procure the removal of the institution to the banks of the Connecticut, he resigned in 1821, and was chosen president of Amherst college.

MOOR FOWL. See PTARMIGAN.

MOORS (Lat. *Mauri*; Sp. *Moros*; Dutch, *Moors*), the people of Mauritania or Morocco and adjoining parts. The Arabs who conquered Mauritania in the 7th century converted to Mohammedanism the native population, who in Europe were still called Moors, though in their own language they called themselves Berbers, while by the Arabs they were termed Moghrebini, "men of the west." Arabic manners and customs, and in a corrupt form the Arabic language, soon prevailed in the country, the Arab conquerors freely amalgamating with their converts, who far exceeded them in numbers. In 711 an army drawn from this mixed population crossed the straits at Gibraltar, so named from their Arab leader, and began the conquest of the Spanish peninsula. The Spaniards and Portuguese called these invaders Moors because they came from Mauritania, and the term Moors with them soon became synonymous with Mohammedans or Moslems, as the invaders designated themselves. The Spanish writers subsequently applied the term to all the Mohammedans of northern Africa; and when, at the close of the 15th century, the Portuguese made their way around the cape of Good Hope and encountered the Arabs on the coasts of E. Africa and of S. Asia, they still called them Moors. Even the Turks, who in race, language, and everything but religion, were foreign and alien to both Moors and Arabs, were sometimes loosely spoken of as Moors by the Spanish historians. In 1246 Mohammed ibn Alahmar, king of Granada, became vassal of Ferdinand III. of Castile, and from this time the Moorish rule declined in Spain, until it received its death blow from

Ferdinand the Catholic, who in 1492 raised the cross on the walls of Granada. After this event many of the Moors emigrated to northern Africa, where they were inhospitably received by the Arabs, but found a home in the coast cities. The remnant in Spain, named Moriscoes, were subjected to a bloody persecution by Philip II., and were finally and completely expelled from Spain by Philip III. in 1609. (See SPAIN.)

MOORSHEDABAD, a town of British India, in Bengal, 124 m. N. of Calcutta; pop. about 150,000, including 90,000 Brahmans and 56,000 Mussulmans. It is the most populous town of the district of Moorshedabad (area, 2,705 sq. m.; pop. in 1872, 1,355,549), but has been superseded by Berhampore as the capital. The town comprises Moorshedabad proper on the E. bank of the Bhagruttee (an arm of the Ganges) and Mahinagar on the W. bank; it extends N. and S. about 8 m., with an average breadth of 4 m. It consists chiefly of mud buildings, but contains a splendid palace of dazzling whiteness, beautifully situated, and completed in 1840; and there is also a native college. The commerce in silk and indigo, the staple products, is considerable, and the situation of the town is the most favorable on the water route between Calcutta and the North-western Provinces; but the port is inaccessible during the spring except for the smallest craft. The defective drainage makes the place very unhealthy. It was once the capital of Bengal, and so prosperous that Clive used to compare it to the city of London; but it has greatly declined. The court of the titular nawaub of Bengal, however, still "plays here its farce of mimic state," according to Hunter's "Our Indian Mussulmans" (London, 1874).

MOORUK, the native name of a species of struthious bird, discovered in 1857 in the island

height of the bird when standing erect is 5 ft., of which the neck is 2 ft.; the color rufous mixed with black on the back, and raven black about the neck and breast; the loose wavy skin of the neck is iridescent, with tints of bluish purple, pink, and green; the feet and legs are large and strong, pale ash-colored, the claw of the inner toe being nearly three times as long as the others; there is a horny plate on the top of the head, resembling pearl covered with black lead; the bill is narrower, longer, and more curved than in the emu, somewhat like that of a rail, with a black leathery cere at the base, and a small tuft of black hair-like feathers behind the plate, continued here and there over the neck; the wings are rudimentary. Living specimens have been exhibited at the London zoological gardens. It seems to form the link between the emu and the cassowary, resembling the former in its bearing and gait; it also resembles the kiwi-kiwi (*apteryx*) in the style of its motions and attitudes; it is tame and familiar in captivity, and when pleased dances about its place of confinement; it will thrive on boiled potatoes, with occasionally a little meat; it emits a peculiar whistling chirping sound, and some louder notes resembling the name given it by the natives; it is shy, difficult to approach, and still more difficult to pursue on account of its speed in running through the thick brush and its extraordinary power of leaping; it has all the inquisitiveness of the domesticated fowls. The eggs are of about the same size and form as those of the common cassowary, having in most cases thick tuberculated shells; they vary from 13 to 14 in. in circumference in the longest diameter, and from 11 to 11½ in the widest; the color is pale olive green, with darker olive tubercles; sometimes they are smooth and without spots.—Another struthious bird is the *C. australis* (Wall), discovered in the Cape York district of Australia in 1854. It is about the same size as the mooruk; the head is without feathers, covered with a bluish skin, and has a bright red protuberance or helmet; the skin of the neck has six or eight round fleshy balls of blue and scarlet; the body is thickly covered with dark brown wiry feathers; the wings are mere rudiments. The flesh was eaten by its captors, and was said to be delicious. It is stronger and heavier than the emu, very wary, and not easily killed except with the rifle.

MOOSE. See **ELK.**

MOOSEHEAD LAKE, an irregular sheet of water on the borders of Somerset and Piscataquis counties, Me., the largest lake in the state and the source of Kennebec river, about 35 m. long and from 3 to 12 m. wide. It is situated 1,023 ft. above the level of the sea, in the midst of a wild and as yet mostly uninhabited region, 2 m. S. of the Penobscot and 75 m. N. by E. of Augusta. The densely wooded shores, which in general are but slightly elevated, rise in Spencer mountain, at the head of Spencer bay on the E. shore, to a height of 4,000 ft. Owing



Moeruk (*Casuarius Bennetti*).

of New Britain, and named by Mr. John Gould *casuarius Bennetti*, in honor of Dr. George Bennett of Sydney, N. S. W., who first brought it to the notice of the scientific world. The

to the varied nature of the surrounding scenery and to the vast numbers of game, including the deer and caribou, which still frequent the primeval forests, Mooshead lake has for many years possessed a high reputation as a resort for tourists and sportsmen. Steamboats ply daily between Greenville on the S. extremity and Mt. Kineo, a distance of about 20 m.

MOOSE WOOD. See MAPLE, vol. xi., p. 139.

MOQUIS, a tribe of semi-civilized Indians in Arizona, between lon. 110° and 111° W., and lat. 35° and 36° N., on the Little Colorado and San Juan rivers. They were among the tribes visited in 1540 by Coronado, who apparently left sheep and other domestic animals among them, which they preserved. The Franciscans in time established missions there, but on the general rising in 1680 the Moquis killed or expelled the missionaries. The viceroy of Mexico in 1723 attempted to reduce the Moquis, but failed. In 1748, however, the Franciscan Juan M. Menchero converted a number of them, with whom he founded the pueblo of Gandia. Of late years they have been peaceable, and have suffered much from the attacks of the Apaches and Navajos. They form nine families or clans, the Deer, Sand, Water, Bear, Hare, Prairie Wolf, Rattlesnake, Tobacco, and Reed Grass clans, the hereditary chief being of the Deer clan. They are an exclusively agricultural people, raising grain, vegetables, fruit, and cotton. They have some donkeys, sheep, and goats. They live in seven villages situated on bluffs from 200 to 500 ft. high, viz.: Taywah (Tegua), Sechomaive, Jualpi (Gualpi), Meshonganave, Shungopave (Xungopavi), and Oreybe. Their houses are, like those of New Mexico, built in terraced stories, reached by ladders, but inferior to them, though formerly much better than at present. They are of stone laid in mud; the rafters are of stout poles, with other poles crossing, covered with rushes; the floors are of earth. They knit, weave, and spin, making blankets and women's robes, which they trade with other tribes. When they first came within the jurisdiction of the United States they were estimated at about 8,000. Intercourse was for a time cut off by hostile tribes, but in 1852 the Moquis sent curious symbolical presents to the president to open the way to their towns. They were almost destroyed by smallpox in 1855-'6, and no help having been given to advance their agriculture, they lost many by famine in 1866-'7. On both these occasions they abandoned their villages and scattered among the mountains or emigrated to their allies the Pueblos of New Mexico. Their population in 1872 was pretty accurately fixed at 1,663, showing a great decline. They use no intoxicating drink, and the women are virtuous. The men wear blankets and leggins of dressed skins, the women a woven tunic and a shawl or blanket. Before marriage the latter wear their hair in two rolls like horns at the side of the head, and after marriage in two rolls at the side of the face. The Moquis

assimilate in many respects to the people of Zuni, New Mexico, their ancient allies.

MORA, a N. E. county of New Mexico, bordering on Texas and intersected by the Canadian river and several of its tributaries; area, about 5,000 sq. m.; pop. in 1870, 8,056. The W. part is mountainous. The chief productions in 1870 were 44,115 bushels of wheat, 57,349 of Indian corn, 27,314 of oats, 41,580 lbs. of wool, and 917 tons of hay. There were 673 horses, 808 mules and asses, 3,328 milch cows, 2,328 working oxen, 3,718 other cattle, 30,561 sheep, and 4,827 swine; 4 flour mills, 1 distillery, and 1 woollen mill. Capital, Mora.

MORADABAD, a town of British India, capital of a district of the same name, in the division of Rohilkund in the Northwestern Provinces, on the right bank of the Ramgunga, 100 m. N. E. of Delhi; pop. about 60,000. It is dilapidated, and even the great central thoroughfare has lost its former cleanly appearance. It has a large market place, used as a bazaar, and an extensive commerce in sugar, cotton, wheat, and other articles.

MORALES, Luis de, a Spanish painter, born in Badajoz in 1509, died there in 1586. Either from his constant choice of sacred subjects or (less probably) from the merits of his work, he received the surname of *el Divino*, the divine. His pictures were nearly all heads, generally of Christ or the Virgin; some authorities believe that there are no instances of his painting the figure at full length. His *Ecce Homo* and *Mater Dolorosa* are the best types of his paintings. In spite of his acknowledged ability, the prices he received for his works are said not to have been enough to compensate him for the great labor and time he spent upon them; and he lived in the greatest want until his old age, when he was supported by Philip II. His chief works are at Toledo, Valladolid, Burgos, and Granada.

MORAL PHILOSOPHY, or *Ethics* (Lat. *mos*, Gr. *ἦθος*, manner, practice), the science of duty; the principles which prescribe what ought to take place, and the reasons why it should take place, in human conduct and actions. The ancient Greeks divided philosophy into logic, physics, and ethics: the first treated the universal and necessary forms of thought; the second, so much of the subject matter of thought as pertains to material nature; and the third, the whole nature and activity of free and intelligent beings. More precisely defined, ethics is that division of practical philosophy comprehending the doctrines of the right in human life, and is distinguished from polity and aesthetics, which embrace respectively the doctrines of the expedient and the beautiful or noble. Or it may be defined as natural in distinction from civil jurisprudence, treating of the relations, rights, and duties by which the members of universal society are by the law of nature under obligation toward God, themselves; and each other. Ethics regards mental dispositions; jurisprudence, outward acts. The

former extends to all moral qualities; the latter is limited to the virtue of justice, since no written law can enjoin gratitude or generosity. Moral law is imposed by the conscience; civil law, by the decree of the legislator. Right is what a man may lawfully or morally do. Duty is what he must morally do. Crime is what he lawfully must not do. Vice is what he morally must not do. The law of nature, or the law of God, embracing the law of nations, is sometimes used as comprehending the whole of morality, the whole theory of conduct, and sometimes as containing only those unwritten rules of justice which are enforced by punishment in civilized countries, and at the breach of which it would be generally thought, if there were no government, that men might defend themselves by violence. Positive law, natural law, and moral law have been termed the three ascending degrees in the whole science of duty. The first inquiry in moral science is after an ultimate rule, a supreme principle of life, which shall be of imperative and universal authority, and around which shall be grouped all the motives and maxims of action. From this central principle every ethical system receives its character. These systems may be ranged in two classes, according as the ultimate moral rule is objective or subjective, dependent on something without or within the mind. The most prominent objective theories are those which adopt as the ultimate principle and basis of morality: 1, the authority of the state; 2, the revealed will of God; 3, something inherent in the nature of things; 4, the greatest happiness. Hobbes maintained the first, and Descartes the second. To the third division belong Dr. Samuel Clarke's theory of the fitness of things, Wollaston's of the truth of things, Wayland's of the relations of things, and President Edwards's of the beauty in the union or consent of one mind with the great whole of being, in the love of being in general. To the fourth division belongs the Epicurean theory of personal pleasure, which was made to coexist with virtue by Aristotle, to which Paley gave a more religious aspect by weighing future eternal happiness against present self-renunciation, and which Bentham advanced with reference to public utility and the greatest good of the greatest number. The principal subjective theories find the essence and test of morality in: 1, natural susceptibility to pride, gratified by flattery; 2, an inner reciprocal sympathy; 3, an inner sense, which gives moral distinctions; 4, an immediate intuition. Mandeville defined virtue as the offspring of flattery begotten upon pride, its motives being vanity, and its object praise. Adam Smith urged that the ground of morality was a reflex sympathy, by which the observer changes place in imagination with the actor, and affirms the action to be right or wrong according as it receives or repels his sympathy. Shaftesbury and Hutcheson maintained a distinct and specific moral sense, which immediately apprehends moral

distinctions, and is to each man the source of obligation and the measure of virtue. Dr. Brown modified this theory by denying the existence of virtue and vice in the abstract, and claiming that a universal sentiment, by reason of the original conformation of the human mind, approves certain intentions and affections as right, disapproves others as wrong, and is the ultimate source of all moral truth. Friedrich von Schlegel regarded this moral sense or universal sentiment as an inward revelation, which is in us but not of us, which is a divinely awakened awe of the Supreme Being, and which enjoins obedience to every form of God's commandments. Those who claim an immediate intuition of moral truth suppose in the human mind a higher reason for the apprehension of universal and necessary principles. The reason immediately beholds the right, and is of ultimate and conclusive authority. Its affirmation, founded on intellectual intuition, is the sufficient sanction of duty. Such, with various modifications, is the theory of Cudworth, Kant, and Coleridge.—Ethics is not, like mathematics or metaphysics, an independent science. It rests upon philosophical or theological principles, only the application or operations of which it deals with. It takes a dynamical and not a statical view of the elements of life. It presupposes human liberty, the power to employ our mental and physical capacities as we will, and to determine the end toward which they shall be directed; for otherwise the sentiments of duty and of responsibility would be without foundation, would at most be mere phenomena of consciousness, and moral philosophy could be only the natural history of human actions. Its distinctive quality would be lost, destiny taking in it the place of duty. The supremacy of the conscience, however it be defined, whose mandate is duty, is also presupposed, since a moral nature is prerequisite to the science of moral action. Conscience implies a supreme law, having reference to a general end, and constituting an ultimate rule of right, the determination of which, and its application to all departments of conduct, are the tasks of moral philosophy. A complete moral system states the supreme good of man, the supreme moral principle which should guide his action, and his particular duties to himself, to mankind, and to God.—Christian ethics is the doctrine of Christian life, embracing so much of dogmatics as pertains not to knowledge but action. Schleiermacher, Rothe, and others have regarded it as identical with dogmatics, on the ground that Christian faith and morals, thought and purpose, knowledge and action, are not separable. It differs from philosophical ethics in its subject, which is not man, but Christians; in its principle, founded on the recognized relation between man and God; in its source, being derived not from the reason, but from the teaching of Christ and the apostles; and in our perception of it, which is not by any analytical process, but by the Christian

consciousness.—The earliest ethical speculations in Greece appear in the maxims of the gnomic poets. The first attempt to introduce a scientific analysis into the details of practical wisdom was that of Pythagoras, whose moral system was linked with a mysterious symbolism of numbers. Of oriental origin, the Pythagorean discipline has been likened to philosophy on 'a tripod; it taught by symbols, spoke in tropes, wrote in verses, and, instead of reasoning, uttered oracles. Its elementary ideas are those of unity and duality, the finite and the infinite, the right and the oblique, to the former of which corresponds good, and to the latter evil. From unity the harmony of numbers is derived, and the sovereign good is the rhythmical order of nature. When the principle of unity predominates in intelligent beings, there is spiritual harmony; and as harmony is not unity, but only an imitation of it, so virtue is not absolute goodness, but only an imperfect representation of it. God is the absolute unity, and is alone wise, and to imitate him as far as possible is the duty of all imperfect beings, who cannot be wise men, but only philosophers or friends of wisdom. The Pythagoreans distinguished the animal soul, whose seat is the heart, and the rational soul, which abides in the brain, and gave to the latter the supremacy. They, therefore, laid stress on self-command and temperance as essential to the vision of truth, and tended to ascetic practices, yet maintained that justice and love were inseparable. They were unsurpassed by any school of antiquity in urging the duties of friendship. The Pythagorean aristocracy resembled an oriental sacerdotal caste, and the Pythagorean political institutions in southern Italy mark the conflict between the genius of the Orient and that of Greece, between theocracy and humanity, the nobility and the people, the servitude of tradition and the liberty of thought. Heraclitus repeated Pythagoras, and Democritus opposed him, founding the sensualist ethical school, and developing the most complete and scientific moral system prior to Socrates, which was, however, only a corollary and result of his atomic physical doctrines. The sovereign good of man, according to him, is not pleasure but happiness, which consists in constant and tranquil content. To be at once temperate, daring, and confident, and, having never done nor wished anything absurd, to trust in fortune, was the whole purport of his ethical maxims. The age of the sophists succeeded. They, however, neither formed a school, nor their doctrines a system. Grammarians, rhetoricians, statesmen, metaphysicians, and moralists, from all the schools of Greek philosophy, their special influence was in inspiring respect for intellectual attainments and performances, and their best service was in habituating the Greek mind to a free examination of all human knowledge. The weapon which they wielded was a rhetorical eloquence, under the sway of which the mythological divinities began to lose their majesty, the ancient

traditions which had charmed successive generations ceased to have authority, the institutions of state tended toward equality and toward a foundation of reason instead of experience, and the enthusiasm of Greek culture was transferred from martial and political accomplishments to the arts, letters, and oratory. Their method was powerful to destroy rather than build up, yet the common statement that they were intellectual and moral corrupters is elaborately disputed by Mr. Grote. He regards them as the regular exponents of Greek morality, neither above nor below the standard of the age, maintains that Socrates was not their great opponent but their eminent representative, that they were the authorized teachers, the established clergy of the Greek nation, and that Plato was the dissenter, who attacked them not as a sect but as an order of society. Socrates is usually styled the father of moral philosophy; yet he was rather a sage than a philosopher, and is renowned rather for his wonderful moral consciousness and for his power of exciting the analytical faculties of others than for his positive speculative thought. He affirmed the reality of the distinction between good and evil, that it was founded in nature and not in convention, yet he did not precisely determine wherein it consists. He enjoined the supremacy of duty, yet he gave no objective or subjective definition of virtue. His highest motive was to make reason prevail in human life, public and private, as it prevails in the universe. The elements of his instruction were: a supreme Deity, the principle of order and beauty in nature, and of justice and truth in man; and a series of human virtues, the principal of which were wisdom or a participation in the divine intelligence, justice, which is conformity to universal reason, fortitude, which gives courage and strength to endure trouble and resist difficulties, and temperance, which subdues the passions and makes us capable of intellectual delights. He was the first to treat distinctly of ethical science, apart from cosmological and metaphysical speculations, and laid down the principle of individual and social security and happiness as the end to which all moral precepts have reference. Like the other moral philosophers of antiquity, he confounded ethics and politics, and was a preacher of virtue in the interest of the state. —The aim of Socrates was to reform morals, that of his disciple Plato was to explain thought. The latter did not frequent public places to teach the excellence of virtue, but, with a mind whose natural function seemed to be the contemplation of the essence of things, he disdained the shadows of earth for the eternal and divine realities of an ideal world, and developed schemes of thought which caused the fathers of the church to recognize him as one of their precursors. His fundamental ethical principle rests upon the antagonism of the visible and the invisible, the divine and the earthly. Man is an exile upon the earth, to which he is united

by his senses and passions; but by his pure intelligence, his love, by dim reminiscences and regrets, he communes with heaven, which is his true home. He thus by opposite faculties and impulses tends to opposite goals. By yielding to the one he degrades himself, and to some extent perishes. By cherishing the other he resumes and retains his divine excellences. The four cardinal virtues are temperance, courage (*θυμός*), wisdom, and love. The first two are relative, the product of earthly imperfection; the second two are real, the remnants of our original perfection. They all have their foundation in wisdom, the fruit of reason, which sees through the material world the world of ideas of which it is a dim copy, and contemplates the supreme beauty of the essential universe. The Platonic morality is therefore speculative; virtue is referred finally to the intellect. A magnificent ideal is presented, the sentiment of love is commanded, and it is assumed that to know the right will be sufficient to practise it. There is no place in his philosophy for that perversity by which the soul sees the better and follows the worse, avoids what it loves and embraces what it hates; a phenomenon, however, which Plato himself has described. The virtue which won his admiration implies a pure intelligence, obedience to which by the heart and will is presupposed. Nor did he precisely define the nature of moral good and evil; his analysis did not reach to the absolute; and he left truth, beauty, and goodness to blend together and lose themselves in their supreme source. God is the principle of moral order, and virtue consists in knowing and imitating him. "Alone among the ancient philosophers," says St. Augustine, "Plato made happiness consist not in the enjoyment of the body or of the mind, but in the enjoyment of God, as the eye enjoys the light." The principle of the ideal contained in his philosophy has proved itself imperishable, and has more than once in modern times prompted both ethical and metaphysical speculations to higher standpoints.—The ethics of Aristotle place the sovereign good in happiness, which is inseparable from virtue, and consists in life and action. The gods themselves are happy only because they act. This theory of activity, which makes virtue to be the best possible disposition of all human functions, was one of the remarkable amendments made by him in the system of his master. An action is right or wrong only when it proceeds from free will and personal responsibility, and its moral desert must be judged by the end which it proposes, that is, by the intention. The Socratic and Platonic mistake of regarding vice as the involuntary product of ignorance is thus corrected. Virtue is a habit, a sort of moral dexterity; single acts cannot constitute it; but the virtuous disposition must be constant, acquired by oft repeated acts, and underlying the whole art of life. But the characteristic ethical statement of Aristotle is that virtue is a mean between

two extremes. At one point all the passions are good; below or above that, they violate the order of nature, and are bad. Equally removed from extreme excess and extreme deficiency there lies in all spiritual and physical conditions an intervening state, which is that of virtue. To act when we ought, in the right circumstances, in the proper manner, and for legitimate persons and purposes—that is the *juste milieu* which characterizes morality. Hence there is always only one way of acting well, while there are thousands in which we may do wrong. He however gives no absolute definition of virtue, as an abstract mean between two abstract extremes, does not determine it as a fixed mathematical point, but makes it relative to the circumstances and disposition of the individual, a centre varying according to the pains and pleasures, desires and hatreds which encircle it. This ingenious theory is derived *a posteriori* instead of suggested *a priori*, is an inference and not an instinct, and has perhaps never been applied as a practical criterion of duty. As in metaphysics Aristotle completely sundered God from the world, so in ethics he separated the speculative from the practical reason, and gave to morality no foundation in absolute science. His moral scheme was a branch of politics, virtue was a civil quality to be developed only in the state, and his views of man and life were not universal but essentially Greek and republican. To prove that man was something more than a member of society was a task for the future.—This task was fulfilled by the cynicism of Diogenes and the stoicism of Zeno, while the conquests of Alexander may be said to have denationalized the Greek ethics. Diogenes proclaimed himself a citizen of the world, and the government of the universe the only polity worthy of our admiration. Opposed to patriotism, family, and property, the cynic placed virtue in the strength to endure privations and in independence of social relations. Under the banner of inward freedom and power, he verged toward asceticism, misanthropy, and impudence. The same tendency more strikingly appears in stoicism, the leading feature of which is tyranny over self, a revolt against the senses and passions, contempt of pain, pleasure, death, and of all the accidents of humanity. It was the philosophy of Roman citizenship, lying underneath the inflexibility of discipline and duty. Cleanthes and Epictetus both declared force to be the only virtue. A rigorous adherence to the essential elements, the lowest terms of human nature, a contempt for pleasure as something not designed in the scheme of natural law and inconsistent with its ideal of the freedom and independence of the soul, a striving to shape the individual life according to the rational nature, which is itself in conformity with the rational order of universal nature, an abstract apprehension of virtue as the subjection of personal to universal ends, and a consequent moral indifference to exter-

nal good, were the prominent characteristics of the ethical system of the stoics, which was rivalled only by Epicureanism in the amount of its influence on Greek and Roman thought and life. Its moral standpoint was one of abstract subjectivity, its scheme of particular duties was conceived with reference to an ideal of rational freedom, and its motives were all heroic. Stern, haughty, and inflexible, it disregarded the lighter graces both of inward and outward nature in its contemplation of the laws and the energy of the primitive forces of the soul. Stoicism was one of the modes of reaction against the degeneracy of Greek society; Epicureanism, another. Like Aristotle, Epicurus placed the highest good in happiness. The prize of life is the possession of supreme pleasure. All other virtues are but the auxiliaries of prudence or wisdom, which is the architect of our happiness, teaching us, in whatsoever situation we may happen to be placed, to derive from it the utmost advantages. Thus by prudence the wise man will abstain from the burden of public affairs and from marriage, will observe the laws of his country, acquire means to live with dignity and ease, practise sobriety and moderation, cultivate friendships, and aim after a life without a trouble (*ἀταραξία*). This serene pleasure he does not allow to be disturbed by fears of death or of the gods; for the gods live in changeless and blessed repose in empty space, undisturbed by any management of human affairs; and death is the end of all feeling, and not an evil to be dreaded, since when death is, we are not. His ethical system does not recognize any positive end of life, and proposes nothing higher than a state of passionless repose; and from the multitude of his disciples during several centuries there proceeded no original thought and no preëminent man. The system itself degenerated, until it became strange that a philosopher who was proverbially blameless and temperate, who nurtured himself on barley bread and water, with which he boasted that he could rival Jupiter in happiness, should have been the founder of Epicureanism. The Horatian *nil admirari* expresses the melancholy but not the sensuality of its later character. The influence of the Platonic and Aristotelian ethical theories declined; stoicism and Epicureanism remained as rival sects. During the first Christian centuries stoicism predominated in intellectual theories, and philosophers of all schools, poets, historians, and rhetoricians, spoke like Seneca and Epictetus of the sacred love of the world, of the equality of man, of universal law, and a universal republic. Unlike the earlier philosophers, who had founded ethics on the system of the human faculties and passions with reference to their combined operation in the state, the Neo-Platonists gave a theological and mystical character to duty in connection with their doctrines of emanation. The object of life was to rise by processes of as-

ceticism and ecstatic vision from the world of the senses into which we have fallen to our original home in the world of ideas, and the virtues which mark the successive steps in this return are distinguished as physical, political, ethical, purificative, contemplative, and theurgic.—While all antiquity had made the sovereign good consist in escape from pain, either by virtue or by pleasure, Christianity by the mystery of the passion announced the divinity of sorrow. From this time until the rise of modern philosophy ethics cannot be separated from dogmatics. During a thousand years of theological speculations on the problems of life, no system of philosophical ethics was attempted. The characteristic element in Christian virtue is love. If the Christian ideal of perfect charity were realized, ethics and politics would alike be absorbed in a higher science. Prominent as were the ideas of faith, hope, charity, and self-sacrifice in the age of the apostolic and the church fathers, their basis remained from the first rather religious than speculative, notwithstanding the persuasion that in the reason enlightened by the Word there was given a ground of union between objective revelation and subjective knowledge. Justin Martyr, "the evangelist in the robe of a philosopher," began to apply the forms of ancient ethical philosophy to Christian conceptions of duty, and maintained human freedom by identifying the will and the conscience. Augustine, though aiming to emancipate Christian thought from antique influences, asserted the rationality of Christian morality, since it sprang from the absolute reason of Christ, who was both the central idea in philosophy and the ideal of life. While Augustine and Pelagius were debating free will and sovereign grace, the same question was discussed in a different form by the last of the pagan philosophers, Plotinus and Proclus. The former, in a scheme of universal and absolute determination, suppressed liberty; the latter urged that the essence of personality was liberty, that man was his own controlling demon, and used the terms *autokinesy* and *heterokinesy*, corresponding nearly to the autonomy and heteronomy of Kant. The most elaborate attempt to combine the moral ideas of Christianity and those of Alexandrian paganism was made by the writings ascribed to Dionysius the Areopagite, which exerted great influence on later mystical theories. In the middle ages, mysticism, scholasticism, and casuistry successively presided over the doctrines of Christian morality. St. Bernard and St. Victor were the leading representatives of mysticism. The former has been surpassed by no author in his delineations of the worth and power of love. From him proceeded that passionate inspiration, which the monastery of St. Victor perpetuated through the middle ages, and which remains embodied in the "Imitation of Christ." The two preëminent Christian sentiments, according to him, are humility and love, both

springing from the knowledge of ourselves. A sense of humiliation is the first experience when we duly regard ourselves, and this prepares for intensity of love, which in its highest degree is felt only with reference to God. The great masters of scholastic theological ethics were Peter Lombard, Thomas Aquinas, and Duns Scotus. The aim of all was to harmonize Aristotelianism and Christianity. The first completed the list of the seven cardinal virtues by adding faith, hope, and charity to the ancient series of justice, fortitude, temperance, and wisdom. The second fully developed the mediæval philosophy of virtue. He made the intellect the highest principle, and distinguished universal and special ethics, the former being that of perfect beings in heaven, the latter that of imperfect beings on earth. Duns Scotus opposed the primacy of the will to that of the intellect, and thus introduced a subjective element in place of the objective knowledge to which Aquinas had given prominence. While by the mystical method morality was referred to inner feelings, aspirations, and conflicts, and by the scholastic method it was founded on systems of intellectual principles, the casuistical method assumed prominence, which limited itself to the determination of duty in particular cases (*casus conscientie*) in practical life. Numerous works of casuistry, some of them designed for the use of the confessional, were produced from the 13th to the 16th century, the principal of which were the *Astesana* by a Minorite of Asti, the *Angelica* by Angelus de Calvasio, the *Pisanella*, also called the *Magistrucchia*, by Bartholomew de Sancta Concordia in Pisa, the *Rosella* by the Genoese Minorite Trouamala, and the *Monaldina* by Archbishop Monaldus of Benevento. The *Astesana* treated in eight books of the divine commandments, of virtues and vices, of covenants and last wills, of the sacraments, of penance and extreme unction, of ordination, of ecclesiastical censures, and of marriage. The tendency of casuistry was to dissipate the essential unity of the Christian life in the technical consideration of a diversity of works. It had begun to decline when it was revived and zealously improved by the order of Jesuits, and became their peculiar ethics. The doctrine of probabilities was developed by them in connection with it. Pascal and others assailed the indefiniteness and ambiguity of casuistical principles. The *Medulla* of Hermann Busenbaum, which is the basis of the *Theologia Moralis* of Liguori, attained the highest reputation as an embodiment of Jesuitical ethics.—In the conflicts of the 16th century, when sects, schools, and parties were confounded and transformed, moral philosophy was subordinate to theology and politics. Montaigne, who of all the writers of the time was most distinctively a moralist, pretended to no system. The conciliatory Melancthon proposed a definition of virtue which includes the special features of all the schools and creeds; Suarez maintained the traditions of scholasticism; and Luther,

Bruno, and Bacon, as well as the later Descartes, prepared in different ways for the achievements of a new era. One of the relics of mediæval discussion was the foundation of natural law. The disciples of Aquinas made it depend on the nature of things; those of Scotus and Occam, on the authority of God. The former made it essentially a matter of the intellect; the latter, of the will. The former tended to establish morality as independent of the Deity, and to affirm the eternal distinction between right and wrong, even if God did not exist; the latter tended to conceive of the moral law as an arbitrary enactment, to regard nothing as good or bad in itself, and the command of a superior as the only foundation of moral distinctions. The ablest representative of the latter theory in modern philosophy is Hobbes. He denied that anything is naturally right or wrong, affirmed that pleasure and pain are the only objects to be desired or avoided, and limited human selfishness only by the control of an absolute civil power, the necessity of which is proved by experience in order to prevent a state of universal warfare. Morality is thus an artificial and prudential arrangement, dependent on the command of the political chief, without which the only virtues would be force and cunning. On the contrary, Grotius maintained moral distinctions anterior to human convention, and established the law of nature and of nations as a special department in ethical science. The idea of natural law was more precisely determined by Pufendorf, who defined it as the precept of right reason among men mutually social, making a disinterested care for the advantage of society the first duty. It does not extend beyond the limits of this life, is limited to the regulation of external acts, and exists in the nature of things and in the eternal principles of the divine reason. Leibnitz disputed each of these three propositions. The theory of Hobbes was professedly opposed by Cumberland, who claimed the existence of certain natural laws, independent of experience, and cognizable by right reason, which prompt us to the exercise of moral and social duties. The eternal and immutable distinction of right and wrong in the mind of God and as pure conceptions of the human reason was sustained by Cudworth, and was the occasion of more precise speculations in England as to the mode or faculty by which we perceive the distinction.—The ethical writings of Malebranche were the most important produced in France in the latter part of the 17th century. Virtue he defines to be the love of universal order, as it eternally existed in the divine reason, where every created reason contemplates it. Particular duties are but the applications of this love. He substituted for the ancient classification of four cardinal virtues the modern distinction of duties toward God, men, and ourselves. Spinoza, according to his opponents, by denying liberty in man and God, by recognizing only one divine substance and the modes thereof,

made morality impossible, notwithstanding his principal work is entitled *Ethica*. But by defining clear ideas as those of the reason and vague ideas as those of passion, and establishing it as the object of existence to attain to clear ideas, he succeeded, like most other moralists, in opposing reason to passion. The being of the soul is thought. To increase this, to rise to a greater reality, to preserve and exalt our essential nature, is at once the highest good and the highest virtue. Knowledge is happiness, and is not the reward of virtue, but virtue itself. To follow our desires is the law of practical life, and limitation, deficiency of might, is the only evil. But evil is merely a relative conception of our own, formed by comparison of things with each other; there is no idea of it with God, who is always in harmony with himself, acting according to the laws of his own essence.—In the 18th century moral philosophy rested in England chiefly on theories of disinterested feeling and the moral sense, in France on sensualism and self-interest; and in Germany the followers of Leibnitz maintained the supremacy of the reason and the doctrine of ideal good. Shaftesbury was the first to employ the term moral sense, which, however, he did not define. Some of his intimations favor the theory of general benevolence proposed by Edwards. Wollaston's definition of virtue as conformity to the truth of things, which Dr. Clarke changed to the fitness of things, gives to it an intellectual foundation, since truth and fitness are intellectual conceptions. Morality thus becomes the practice of reason. Hutcheson developed the suggestion of a moral sense by Shaftesbury, and supposed conscience and taste to be separate faculties which immediately introduce us to the objects of aesthetics and ethics. But neither he nor Bishop Butler, after thus determining the subjective condition of virtue, undertook to show the objective distinctive quality common to right actions. Nothing therefore but the immediateness of moral emotion and determination is secured by their theory, since neither the moral sense nor the morality of actions is explained by the statement that they correspond to each other. Adam Smith, in referring morality to the principle of sympathy, rendered a service rather to the philosophy of the sympathetic affections than of ethics. Though perhaps no one has ever accepted his statement that moral approval depends first upon sympathy with the motives of the agent, secondly upon sympathy with the gratitude of those who have been benefited by his actions, thirdly upon a perception that his conduct has been agreeable to the general rules by which these two sympathies generally act, and fourthly upon a perception of the utility and beauty apparent in a system of behavior which tends to promote the happiness either of the individual or of society; yet his analysis of the workings of sympathy is admirably conceived and illustrated. It was a part of Hume's ethical theory that general utility constitutes a

uniform ground of moral distinctions. Denying a special moral faculty, he spoke sometimes of sympathy and sometimes of benevolence as the subjective quality which prompts us to be pleased with beneficial actions. Richard Price attempted to revive the intellectual in place of the sentimental theory of virtue, claiming that not only our moral feelings but all our emotions might ultimately be referred to the reason. He regarded right and wrong as simple ideas of the mind.—The maxim of La Rochefoucauld, "Our virtues lose themselves in interest, like rivers in the sea," describes the ethical theory of the French sensational philosophy. Condillac, the head of this school, regards all intellectual operations, even judgment and volition, as transformed sensations; and Helvétius, applying the theory to morals, held that self-love or interest is the exclusive motor of man, denied disinterested motives, made pleasure the only good, and referred to legislative rewards and punishments as illustrating the whole system of individual action. A superior physical organization alone gives to man his superiority to other animals. La Mettrie maintained an atheistic Epicureanism; and though Condorcet proposed as a goal the perfectibility of mankind in the present state, he looked only to physical improvement, and wished to substitute an empirical education for the ideas and sanctions of religion and morality. The materialism, atheism, and fatalism of the epoch, which saw in the universe only matter and motion, and had pleasure for its single aim and law, were most completely and logically elaborated in D'Holbach's *Système de la nature*.—The influence of Leibnitz and Wolf maintained a higher philosophy in Germany, and the latter advanced the ethical principle that we should act only with reference to making ourselves or others more complete and perfect. Moral perfection consists in the harmony of the present with the past and the future, and of ourselves with the essential nature of man. Whatsoever tends toward or against this is right or wrong. Thus ethics is the science of the possible in life, as philosophy is of the possible in the whole realm of knowledge. A eudæmonistic and utilitarian school succeeded in the latter half of the 18th century, marked by subjective idealism, which made individual culture and happiness the highest principle and end, and cherished religion on the ground that it was advantageous to earthly pleasure. Basedow, Reimarus, and Steinbart were the principal representatives of this tendency, the subjective standpoint of which appears also in numerous confessions and autobiographies, like those of Rousseau.—Kant rescued ethics from the prevalent sentimental and sensational theories. "If," said he, "happiness, and not the law of inward freedom, be made the fundamental principle, there is an end to moral science." He defines ethics as the philosophy of the laws of freedom. Freedom is an *a priori* fact, an element which affirms itself in the activity of the will. The

will has the capacity of entire independence or self-determination, bound only by its own autonomy. The pure reason proposes to it a universal law, which we call the moral law, and which is a categorical imperative, requiring an unconditioned obedience. This law is, in Kant's phraseology, the form of human action. Desires, passions, and material motives furnish the contents of action, and their influence constitutes the heteronomy of the will. To exclude principles that are merely of a heteronomic nature, to admit only such motives as may be transformed into universal laws of the reason, so that the autonomy of the will may be inviolate, is the essence of morality. Thus the ethical law of Kant is: "Act only on such a maxim as may also be a universal law." A reverence for the moral law, which he compares to the starry heavens, a severance of the impulses of sense from moral motives, and an estimate of virtue as a triumph over resistance, characterize the Kantian morality. Sanctity is absolute conformity to the moral law, the ideal of moral perfection. Virtue is a constant tendency and progress toward this ideal. The supreme good is the highest happiness joined to the highest virtue. Since these do not correspond in the present state, the practical reason postulates for the attainment of the first the existence of God, and for the attainment of the second the immortality of the soul.—Personal autonomy becomes still more prominent in the philosophy of Fichte. According to him, the most profound and essential truth of our existence is the perpetual striving of the mind to develop itself, to realize its own nature, to bring into actual existence all that lies potentially in its consciousness. This fundamental impulse furnishes the formal principle of ethics, the principle of absolute autonomy, the self-formed aim of being. With it is associated the impulse of nature, which strives not for fulness and freedom, but for enjoyment. Both impulses aim at a unity, and their approximation is an infinite progression. "The world," says Fichte, "is the sensized material of our practical life, the means by which we place before us, as object, the end and aim of our existence." Destiny is the course of the moral determination of the finite rational being. The formula of ethics is therefore: "Always fulfil thy destiny;" this underlies the whole theory of particular duties. The conviction of duty, or conscience, is the condition of the morality of actions. A feeling of truth and certainty is the absolute criterion of the correctness of this conviction, and never deceives, since it exists only when the empirical is in harmony with the absolute Ego. In the later form of Fichte's philosophy, its moral strictness was relieved by religious sentiment, the elements of the Ego and duty being transformed into life and love. His formula, making morality the fulfilment of destiny, is akin to the theory of Aristotle, and was adopted by Jouffroy, the principal moralist of the French eclec-

tic school. In ethics alone Schelling scarcely departed from the principles of Fichte. In the system of Hegel, jurisprudence, ethics, and politics form the three divisions of the philosophy of mind viewed objectively. The removal of the antagonism between the universal and the particular will constitutes morality. To pursue the rational, or what is in accordance with the universal will, is right; to pursue the irrational is wrong. The three spheres in which moral purpose appears are the family, civil society, and the state. The state is the ethical whole, the highest embodiment of the moral idea, and its will should be supreme over that of the individual. He thus recurs to the ancient notion of merging ethics in politics, gives to morality a foundation of civil absolutism, and regards the rise and fall of states as historical developments of special phases of the reason. Herbart resolves ethics into aesthetics. De Wette adopted Jacobi's principle of feeling as the moral lawgiver, and stated the formula: "Live in order to live, and out of pure reverence and love of life;" and Schleiermacher founded a system of ethics in which prominence is given to personal responsibility, and the invisible kingdom of God is made the highest good. Schopenhauer, in consequence of his peculiar psychology, held that progress could be made only by denial of the lower or sensuous instincts, and taught as the fundamental principle of his ethics a form of asceticism. He held indeed to a generous sympathy with our fellow men in all their sufferings and woes, and would encourage even the most heroic exertions in their behalf. But in reference to ourselves he inculcated a pretty severe asceticism. The world, in his estimation, so far from being the best possible, is about as bad as it can be; and while sympathy and the exertions to which it leads tend to alleviate the sufferings of others, asceticism destroys the occasion for sympathy by preventing the evils which excite it. Beneke, however, a contemporary with Schopenhauer, inculcated a system in which morality is based on the feelings. This occasioned the outcry of "Epicureanism," and led him to publish a defence, which however, while varying the statements somewhat, left the general character of the doctrines unchanged. (*Die beiden Grundprobleme der Ethik*, 1841; 2d ed., Leipzig, 1860.) The more recent German works that embrace the subject of moral philosophy are less metaphysical, being based principally on the results of recent physiological and psychological researches. They attempt, says Lichthorn, when speaking of the purpose of his own work, *Die Erforschung der physiologischen Naturgesetze der menschlichen Geistesthätigkeit* (Breslau, 1875), to show that the old metaphysical separation of body and soul, and the assumption that the relationship is merely mechanical, leads to results contrary to experience; and to establish the possibility of reaching a correct solution by combining the great discov-

eries of Du Bois-Reymond on the electro-magnetic nature of sensations and volitions, those of Darwin on organic adaptation and heredity in the animal world, and Haeckel's ever increasing organic perfectibility. The writings of Moleschott, Karl Vogt, Büchner, and Strauss exhibit a similar tendency when treating ethical questions. Eduard von Hartmann's *Philosophie des Unbewussten* (1869), though more metaphysical, keeps also in unison with the last dicta of experimental science. A further development of this system is Venetianer's *Der Allgeist: Grundzüge des Panpsychismus* (Berlin, 1874).—Against the doctrines of a moral sense and of disinterested benevolence which had chiefly prevailed in English ethical philosophy from the time of Hutcheson and Butler, and which were zealously defended by Dugald Stewart, a utilitarian tendency was manifested which culminated in Jeremy Bentham. Previous to him Tucker had developed a system akin to the selfish theory, founded on Hartley's principles of association; and Paley had declared the motive to virtue to be everlasting happiness, and had resolved the art of life into that of rightly settling our habits. Bentham gave to his moral theory the name of "the greatest happiness principle," and represented the practice of virtue as the art of maximizing happiness. All moral action proceeds, according to him, from the calculation of pains and pleasures, estimated by their magnitude and their extent. In the proper balancing of these all morality consists, and virtue and vice are absolutely nothing, merely fictitious entities, when separated from happiness and misery. His aim was to expel from ethical science the word "ought," which was claimed by Mackintosh as the simplest and most universal expression of the moral sense. "The talisman of arrogance, indolence, and ignorance," says he, "is to be found in a single word, an authoritative imposture, which in these pages it will be frequently necessary to unveil. It is the word 'ought.' If the use of the word be admissible at all, it 'ought' to be banished from the vocabulary of morals." Till this is done he proposes to neutralize its effect by the use of another potent word—"why?" Yet Whewell has remarked that it is a mere assumption to prescribe that the answer to this query must be in the language of the utilitarian theory. Bentham urged the formation of general rules of conduct, and strict conformity to them, in order to avoid the temptations of our frailty and passions; and if a reverence for virtuous maxims and precepts thus takes the place in the mind of the utilitarian of the direct application of his principle, there will be little difference between him and the believer in immutable morality, since the practical rules of both will coincide. The latter writings on moral philosophy in England seem to have settled down upon the doctrines: 1, that the aim of morality should be the striving after an ideal standard of human ex-

cellence; those most religiously inclined being disposed to take Christ as the ideal standard; others, looking to a model which they have formed for themselves, considering man, his nature and his relations; 2, that there are certain self-evident truths or fundamental axioms in morals as in mathematics, to which assent is given by all minds as soon as their meaning is fully comprehended; 3, that the character of all acts is to be determined by reasoning upon their natural tendency, differing in this from Paley's system and the systems of expediency in general, in teaching that the character of acts is to be determined rather by their general features than by the peculiar circumstances of each particular case, and that thus a system of moral philosophy can be built up by reasoning concerning classes of acts, as truthfulness, benevolence, fraud, &c., just as we build up a system of mathematics by reasoning concerning lines, surfaces, solids, &c.; the reasoning being based in both cases alike upon certain self-evident axioms and certain definitions of classes of acts. John Stuart Mill, who acknowledges the influence of both Bentham and Comte, in the latter portion of his work on "Logic" proposes and discusses the inquiry whether ethics may not be reduced to a certain science, and principles be as definitely established in the art of life as the indisputable laws of physics. He develops the subject no further than to state that happiness, in the full meaning of the word, must be the recognized goal of existence and aim of action. Herbert Spencer, without treating moral science in a special work, includes an ethical theory in his general doctrine of evolution. He holds that the science of right conduct determines how and why certain modes of conduct are detrimental and others beneficial. These deductions are to be taken as laws of conduct, and to be conformed to irrespective of a direct estimation of happiness or misery. There have been and still are developing in the race certain fundamental moral intuitions, which are the results of accumulated experiences of utility gradually organized and inherited, which have come to be quite independent of conscious experience; and these moral intuitions will respond to the demonstrations of moral science, and will have their rough conclusions verified by them. Happiness is the end, and the conduct which tends to happiness is right for that reason; yet because the laws of life are fixed, the course of conduct which will secure the greatest happiness will necessarily restrict many individuals. The principles by which individuals are restricted for the sake of the whole are the principles of absolute morality; while the absolutely moral man is not one who conforms to these principles from external coercion or self-coercion, but who acts them out spontaneously. Alexander Bain identifies conscience with education under authority. He holds that self-approval and disapproval are transferred, by constant association, from the experience of

reward and punishment for actions to the corresponding disposition to do or avoid those actions. He founds his conclusion on these reasons: 1. That human beings in society are placed under discipline. 2. That when moral discipline is neglected, there is no security for virtuous conduct. 3. That the association of an action with disapprobation and punishment gives rise to a state of mind, in reference to it, which is not distinguishable from moral sentiment.—The Italian school of philosophy of the present century presents the subject of ethics in new phases. Virtue, according to Rosmini, is founded on the idea of possible being. Universal being is the absolute good and the principle of every particular good. Moral good is the absolute good in so far as it is desired by man, since it is desire which first leads him to the idea of perfection, which is elaborated into that of being. The first precept of the moral law, therefore, is to love being as such. But as the moral act must be with reference to the ultimate goal and infinite object of thought, the formula is thus transformed: "Love intelligent beings, not for themselves, but for their supreme end, which is God." Virtue consists in the conformity of intuitive to reflex knowledge, and its essential principle is truth. Obligation rests on the power of rational decision, on what a person knows. Conscience is a speculative judgment on the morality of the practical judgment and on its consequences. Mamiani, also, seeks in ontology the sources of moral order. According to him, "absolute good exists," and a deduction from the idea of a first infinite cause is the fundamental principle of ethics. Virtue is the voluntary coöperation of free and rational beings in the moral order of the universe, in which consists the absolute good, and which converges to God. Deviation, on the contrary, is evil and sin. The moral law in most general terms commands: "Do good." Duty requires the accomplishment of the part assigned to each individual in working out the supreme end of society. But beyond this fulfilment, there is a heroic virtue whose object is the greatest possible realization of good, and which consists in the appropriation of individual capacities to the general interests of society. Mamiani maintains, as a matter of history, that right intentions have never resulted in greater evil than good, but that by a preëstablished harmony even a false application of a truth must result in some undesigned advantage. The law of progress reigns in the moral as in the material world, and ultimate perfection in an immortal state is the goal of humanity. Gioberti defines virtue to be the knowledge of an absolute law and the conformity of a free will to that law. Law is an idea considered in reference to the will, and an ethical must be founded on a metaphysical system. An ultimate law cannot be considered independently of religion, because it is in fact God himself. The divine will manifested in the moral im-

perative appears clothed with an absolute right. God as the absolute law reigning over the free human will is the condition of obligation. The ideal formula of Gioberti transferred to the department of ethics becomes: Being, by means of the human will, creates the good; the human will, preferring law to affection, creates virtue; virtue, reconciling affection with law, creates happiness. All these Italian systems of ethics recall the ancient speculations on the subject by referring virtue ultimately to the intellect, making ontological conceptions of being the foundation of responsibility. They also connect virtue closely with religion, and give to it something of an ecclesiastical character.—The study of moral philosophy by American writers runs back into the last century, when Jonathan Edwards developed his theory of the nature of virtue, which he defined as the love of being in general, including under the term being both God and man, thus finding a philosophical formula for the Scriptural summary of the law. The theory of Edwards was modified by his followers, Samuel Hopkins and Nathaniel Emmons, who made virtue to consist in disinterested benevolence, rigidly excluding all self-love. Their theory, however, was held rather as a religious doctrine than as a philosophical opinion. Following the general direction of Edwards, President Dwight and Dr. Taylor held that benevolence is the highest good, blessing both giver and receiver; man being so constituted that he finds his highest happiness in promoting the happiness of others. More recently President Wayland has held that the rule of right is seen in the apprehension of the relations between things; as the relation of parent and child, state and citizen, Creator and creature. President Hickok holds that there is an imperative of reason, which impels us to do that and that only which is due to spiritual excellency. In worthiness of the approbation of our spiritual nature every virtue finds its end. This absolute right is simple, immutable, and universal. Prof. Haven holds that right is a simple idea incapable of definition, expressing an eternal and immutable distinction inherent in the nature of things, and not the creation of arbitrary power, whether of man or God. It belongs to all voluntary rational action, arises with the dawn of intelligence, and is universal, and not derived from anything external to the mind itself. Education simply appeals to it. President Hopkins holds that the moral problem is an inquiry after the nature and ground of obligation. It presupposes a moral nature in man, but is not an inquiry as to man's moral powers. The ultimate obligation is that we should choose that which leads to the attainment of the end of our existence, and this is found in love; all questions under theoretical morals may be resolved by an exposition of the law of love, and all questions under practical morals by an exposition of love as a law.—See Meiners, *Allgemeine kritische Geschich-*

te der älteren und neueren Ethik (1800-'1); Möller, *Das absolute Princip der Ethik* (1819); Stäudlin, *Geschichte der Moralphilosophie* (1822); De Wette, *Christliche Sittenlehre* (1819-'21); Henning, *Principien der Ethik in historischer Entwicklung* (1824); Vetter, *Ueber das Verhältniss der philosophischen zur christlichen Sittenlehre* (1834); Daub, *Vorlesungen über die Prolegomena zur theologischen Moral, und über die Principien der Ethik* (1839); Wirth, *System der speculativen Ethik* (1841-'2); Rothe, *Theologische Ethik* (1845); Fuchs, *System der christlichen Sittenlehre* (1850); Gioberti, *Del buono* (1843); Rosmini-Serbati, *Filosofia del diritto* (1844); Bautain, *Philosophie morale* (1842); Denis, *Histoire des théories et des idées morales dans l'antiquité* (1855); Janet, *Histoire des idées morales et politiques* (1856); Mackintosh, "Dissertation on the Progress of Ethical Philosophy" (1815); Blakey, "History of Moral Science" (1833); Whewell, "History of Moral Philosophy in England" (1852); Wayland, "Elements of Moral Science" (1835); Alexander, "Outlines of Moral Science" (1852); Hickok, "Moral Science" (1853); Haven, "Moral Philosophy" (1859); Mark Hopkins, "Lectures on Moral Science" (1863), and "The Law of Love, and Love as a Law" (1868); Bain, "Mental and Moral Science" (1868); and E. H. Gillett, "The Moral System" (1874).

MORAN. I. Thomas, an American artist, born in Bolton, Lancashire, England, Jan. 12, 1837. His family came to the United States when he was seven years old and settled in Philadelphia. At the age of 16 he was apprenticed to an engraver, but at 19 became a landscape painter, though he never studied under any master. In 1861 he visited England to study the works of Turner and other English artists, returning in 1862. In 1866 he visited England, France, Italy, and Switzerland. He removed to Newark in 1871, and accompanied an exploring expedition to the Yellowstone river. On his return he painted (1871-'2) "The Grand Cañon of the Yellowstone," on a canvas 7 by 12 ft. in size. He afterward visited many parts of the west, including the Yosemite valley and the cañons of the Colorado river, and from studies made in the latter region painted (1873-'4) "The Chasm of the Colorado," a picture of the same size. For these two paintings, which were bought by congress, and were the first landscapes ever purchased by the government, the artist received \$20,000. Among his other works are: "Balboa discovering the Pacific" (1860); "Salvator Rosa sketching Banditti" (1860); "Childe Roland" (1861); "Autumn on the Wissahickon" (1863); "The Wilds of Lake Superior" (1864); "The Track of the Storm" (1865-'6); "The Woods were God's first Temples" (1867); "Hiawatha and the Serpents" (1868); "Dream Land" (1869); and "The Castle of Indolence" (1871). He is also a successful illustrator of books. **II. Peter**, an American artist, brother of the preceding,

born in Bolton, March 4, 1842. When 16 years old he was apprenticed to a lithographic printer, but soon began the study of landscape painting with his brother Thomas. Having become convinced that his best efforts were in animal painting, he went to London in 1864 and spent many months in the study of Landseer's works. Among his principal works are: "A Quarrelsome Family," "Domestic Felicity," "Return from the Fair," "Troublesome Models," "The Dawn of Day," "Morning after the Storm," "The Critics," "An Outcast," and "A Rainy Day."—EDWARD, another brother, is also an artist, devoting himself to marine subjects.

MORAT (Ger. *Murten*), a town of Switzerland, in the canton and 8 m. N. by W. of the city of Fribourg, on the S. E. shore of the lake of Morat, and on the high road from Bern to Lausanne; pop. in 1870, 2,328. It has a castle and a commercial school, and is memorable for the victory achieved there by the Swiss over Charles the Bold of Burgundy, June 22, 1476. An obelisk was erected on the battle field in 1822. (See CHARLES THE BOLD.)—The lake is about 6 m. long, 2½ m. broad, and 350 ft. deep. A narrow and flat strip of land separates it from the lake of Neuchâtel, into which it empties through the river Broye.

MORATA, Olympia Fulvia, a learned Italian woman, daughter of the poet Fulvius Peregrius Moratus, born in Ferrara in 1526, died in Heidelberg, Oct. 26, 1555. She received a careful and extended classical education, and early in life (according to some authorities in her 16th year) lectured in Ferrara on subjects of classical learning. She married a German physician, Andreas Grunthler, and lived at Schweinfurt, where she became an early convert to Protestantism. In 1553, when the city was captured by Margrave Albrecht of Brandenburg, her library was plundered, and she was compelled to flee to Hammelburg. Soon afterward her husband was appointed professor at Heidelberg, and she removed with him to that city. Her works consist of Greek and Latin poems, published in Basel in 1558, and in frequent subsequent editions. Biographies of her were written by Nolten (Frankfort, 1781 and 1775), Kartzschke (Zittau, 1808), and Bonnet (Paris, 1850). The last has been translated into German by Merschmann (Hamburg, 1860).

MORATIN. I. Nicolas Fernandez, a Spanish poet, born in Madrid, July 20, 1737, died there, May 11, 1780. He was a lawyer by profession, but became the reformer of the Spanish theatre, and, with the aid of a royal injunction, drove the *autos sacramentales* from the stage. He wrote a comedy called *Petimetra* (1762), *Diana*, a didactic poem (1765), and a narrative poem, *Las naves de Hernán Cortés*. His best tragedies are *Lucrecia*, *Ormesonda*, and *Guzmán el Bueno*. He also wrote in prose on historical subjects. In 1821 his son published a volume of posthumous poems, together with a life and some of his more celebrated lyrics. **II. Leandro Fernandez de**, a Spanish dramatist,

son of the preceding, born in Madrid, March 10, 1760, died in Paris, June 21, 1828. He worked as a jeweller till he was 23 years old. At 18 he obtained the second prize of the academy for his poem *La toma de Granada*. In 1780 he published a satire entitled *Leccion poetica*, and in 1787 he was made secretary to the Spanish embassy at Paris; and he was afterward sent at the public charge to study the drama of Germany, England, Italy, and France. On his return an office in the department of foreign affairs was assigned him. About this time he published a translation of Hamlet, and brought out in the theatre *El baron* (1803), *La mogigata* (1804), and *El si de las niñas* (1806), the most popular of his plays, performed for 26 nights consecutively, reprinted four times in the same year, and translated into many languages. After many misfortunes he went to Paris in 1827, and died in poverty. Other celebrated works of Moratin are the comedies *El viejo y la niña* and *La comedia nueva*, and *Origenes del teatro español*. He has been called the Spanish Molière. A complete edition of his works has been published.

MORAVIA (Slav. *Morawa*; Ger. *Mähren*), a margraviate and crown land of Austria, situated between lat. 48° 40' and 50° 15' N., and lon. 15° 10' and 18° 28' E., bounded N. and N. E. by Prussian and Austrian Silesia, E. and S. E. by Hungary, S. by Lower Austria, and W. and N. W. by Bohemia; area, 8,585 sq. m.; pop. in 1872, 2,030,975. The country is mostly mountainous, the principal ranges being the Moravian mountains, the Sudetic range with its eastern continuation the Gesenke, and the Carpathians, which respectively separate it from Bohemia, Silesia, and Hungary. The valleys and the southern districts, which are mostly level, are fertile. The principal rivers are the March or Morawa, which rises in the northern corner of the country, flows S. S. E. and S. S. W. through its entire breadth, receiving almost all other watercourses, and after forming a part of the Hungarian boundary falls into the Danube; the Beczwa, E. of the March, and the Hanna, Zwittawa, Schwarza, Iglawa, and Thaya, W. of it. The Oder, which flows N. E. into Silesia, has its head waters S. of the Gesenke range. The climate is comparatively mild. Moravia yields excellent grains and fruits, hemp, flax, and wine, and vast quantities of timber, iron, coal, marble, alum, vitriol, sulphur, lead, and pipe clay, and some silver. Some of the mines have been known since the 8th century. Gold and silver were formerly extracted, but little attention has been paid to these ores since the 16th century, and the iron and coal mines are not worked to their full extent. Pasturage covers a considerable extent of the country, and large numbers of cattle, sheep, and horses are reared. Woolen, linen, cotton, thread, leather, arms, needles, domestic utensils, porcelain, pottery, glass, paper, beet sugar, and chemical products are manufactured. Railways intersect the coun-

try, connecting it with Austria proper, Bohemia, Silesia, and Galicia. The inhabitants are mainly of Slavic origin (about 72 per cent.), including Slovaks on the confines of Hungary, Hannaks in the fertile central region watered by the Hanna, and the Czecho-Moravians in the districts adjoining Bohemia. The Germans (26 per cent.) and Jews (2 per cent.) mostly inhabit the towns, the former being most numerous in the regions adjacent to Silesia and Austria. The bulk of the inhabitants are Roman Catholics, the number of the Protestants amounting to 57,000, and that of the Jews to 42,000. Previous to 1848 the latter were subject to the most oppressive obligations and restrictions. The Roman Catholics are under the archbishop of Olmütz and the bishop of Brünn; the Lutherans and Reformed have each one superintendent. Educational institutions of a high grade are numerous, and about 99 per cent. of the children of proper age attend school. The university of Olmütz has been abolished. The provincial diet is composed of the *Landeshauptmann*, the archbishop of Olmütz, the bishop of Brünn, and 97 deputies. Next to Bohemia and Lower Austria, Moravia has the largest number of manufactories of any Austrian province, the aggregate annual value of the manufactures being estimated at about \$74,000,000. In politics and literature the Moravians, mainly according to national lines of division, partake in the movements of the Czechs in Bohemia or of the Germans in Austria.—Before the close of the 6th century the country was successively occupied by the Quadi, Rugii, Heruli, and Longobardi, and in the following period by Slavic tribes, who, after the decline of the kingdom of the Avars, founded the empire of Great Moravia, the name being derived from the river Morawa (March). Charlemagne conquered it, and he and his successors exacted tribute and the adoption of Christianity, of which St. Cyril became the great apostle among the Moravians. Swatopluk, who rebelled against the German emperor toward the close of the 9th century, made Moravia a powerful state; but it soon after succumbed to the combined attacks of the Hungarians and Germans. Moravia was now often invaded by Poles, Hungarians, Czechs, and Germans. In the 11th century it was attached to Bohemia, and about the end of the following century constituted a margraviate of the empire, though dependent as a fief upon the Bohemian crown. After numerous divisions, it came with Bohemia into the possession of the house of Hapsburg by the death of King Louis II. of Hungary and Bohemia in the battle of Mohács (1526), his crowns being inherited by Ferdinand I. of Austria. The Austrian constitution of 1849 made it a separate crown land, as well as Austrian Silesia, which was formerly united with it. (See AUSTRIA, and BOHEMIA.) In 1866 Moravia was invaded by the Prussians.—See Dudík, *Mähren's allgemeine Geschichte* (4 vols., Brünn, 1860-'65).

MORAVIANS, United Brethren, or the *Unitas Fratrum*, a church of evangelical Christians, historically and ecclesiastically distinct from the society of the "United Brethren in Christ," with whom they are often confounded. Their history proper begins with the year 1457; but their preparatory history extends back as far as the 9th century, when Christianity was introduced into Bohemia and Moravia by Cyril and Methodius, who gave the people a Slavic version of the Bible, and built up a national church. (See CYRIL and METHODIUS.) Hence for several centuries the people of Bohemia and Moravia manifested the spirit of what was afterward Protestantism, holding fast to ecclesiastical principles opposed to the injunctions of the Roman Catholic church, and submitting to the Bible as the only rule of faith and practice. Eventually, however, they were brought under the sway of the papal see. The most celebrated of their reformers was John Huss, who was burned at the stake in 1415. As soon as the news of his death reached his native country, fierce disturbances broke out. A powerful party arose, called the Hussites, who waged war for several years with great fury against the imperialists. After a time the Hussites separated into two factions: the Calixtines, who insisted principally on the restoration of the cup to the laity in the Lord's supper; and the Taborites, whose aim was a general reformation of the whole church. In 1433 the council of Basel granted the celebrated "compacts" to the Bohemians, by which the most essential of their demands were nominally conceded. The Taborites refused to receive these compacts; whereupon the Calixtines turned their arms against them, and totally defeated them in 1434. The Calixtines now became the national church of Bohemia, and hostilities ceased. But a party among the remnant of the Taborites, dissatisfied with what they regarded as corrupt practices in this church also, withdrew more and more from the communion of the Calixtines, and through the instrumentality of Rokitzana or Rokyzan, the Calixtine candidate for the archbishopric, who at first favored the movement, received permission from George Podiebrad, then regent and subsequently king of Bohemia, to settle on one of his estates, known as the barony of Litiz or Liticz. This was in 1456. A considerable number of persons under the leadership of Gregory, a nephew of Rokitzana, took up their abode on this estate. In 1457 they organized a religious society, elected 28 elders, and took the name of "Brethren and Sisters of the Law of Christ," which was afterward changed to the simpler one of "Brethren." At a later period the title *Unitas Fratrum* or "Unity of the Brethren" was adopted. Their pastors were Calixtine priests who entertained evangelical views, and who had joined the society. Such was the beginning of the Moravian church. In 1461, at the instigation of Rokitzana, who had become their inveterate enemy, a fierce per-

secution burst upon the Brethren, many of whom suffered martyrdom. This persecution only served to increase their number, and in 1467 a synod was held at Lhota, on the estate of Litiz, to effect a more complete organization. After protracted deliberations the Brethren resolved to separate entirely from the national establishment, and to change their society into an independent church. Being anxious to secure a ministry whose validity the Calixtines and Roman Catholics would be compelled to acknowledge, they sought the episcopal succession from a colony of Waldenses, settled on the confines of Bohemia and Austria, who had obtained this succession. The Waldensian bishop Stephen, and his assistants, consecrated three men sent to him by the synod of Lhota to the office of bishop. As soon as these events became known, new persecutions broke out, but the Brethren continued to increase. Toward the close of the 15th century they had more than 400 churches in Moravia and Bohemia, had published several confessions of faith, owned two printing establishments, and were preparing a catechism and hymn book for publication. In the 16th century they sent several deputations to Luther, but there were differences of opinion between them and him in respect to discipline, on which the Brethren insisted very strongly. They established churches in Poland, and at length the *Unitas Fratrum* was composed of three provinces, the Bohemian, Moravian, and Polish, each governed by its own bishops, but all confederated as one church, holding general synods in common. In the beginning of the 17th century the *Unitas Fratrum* became one of the legally acknowledged churches of the land. A remarkable work, completed some time before, was the celebrated Bohemian Bible of Kralitz, translated from the original by a committee of bishops, after a labor of 15 years. In 1621 Ferdinand II. began a series of persecutions directed against all the Protestant denominations in Bohemia and Moravia, and known as the anti-reformation. His plans were successful. Protestantism was totally overthrown in these countries, more than 50,000 of whose inhabitants emigrated. The Brethren's church ceased to exist in Bohemia and Moravia, but continued in Poland about 30 years longer, as a church in exile. This church, too, was destroyed in the war with Sweden (1656), the remnant uniting with the Reformed denomination. In this way the *Unitas Fratrum*, as a distinct organization, disappeared for 66 years. But John Amos Comenius, the last bishop of the Moravian line, not only published several works by which the history, doctrines, and discipline of the Brethren were preserved, but also provided for the continuance of the episcopate. (See BOHEMIAN BRETHREN.) Many families in Moravia still secretly entertained the views of their fathers. Among these an awakening took place in the first quarter of the 18th cen-

tury, through the instrumentality of a Moravian exile named Christian David. In consequence of this awakening, the desire to live in a Protestant country was felt more and more. Fifty years after the death of Comenius, in the night of May 27, 1722, two families of Moravians escaped from their native country, and reached Berthelsdorf, an estate in Saxony belonging to Count Zinzendorf, who had offered them a refuge. Other Moravians soon joined them, and in five years a colony of 300 persons lived on Count Zinzendorf's estate. They built a town, and called it Herrnhut; introduced the discipline of their fathers, preserved by the publications of Comenius; and in 1735 obtained the episcopal succession of the Unitas Fratrum. Zinzendorf soon became a bishop of the Brethren, and devoted himself entirely to their service. Churches were established in various parts of the continent, in North America, and in Great Britain. In 1749 the British parliament acknowledged the Moravian Brethren as an episcopal church, and passed an act encouraging them to settle in the North American colonies. They devoted themselves to missions among the Indians with great success, one of their most celebrated stations being at Gnadenhütten ("tents of grace") in what is now Tuscarawas co., Ohio, where 100 Moravian Indians were treacherously massacred by whites, March 8, 1782, on a groundless suspicion of having been concerned in certain outrages in Pennsylvania. The numbers of the Brethren, both in America and in Europe, never increased as did those of many other denominations of Christians. This was owing to two causes. First, almost the entire strength of the renewed Moravian church was concentrated on the foreign mission field. Secondly, the fundamental principle underlying the efforts of Zinzendorf and his coadjutors, on behalf of the church at home, was Spener's idea of *ecclesiola in ecclesia*, little churches within the church, households of faith whose members should be separated as much as possible from the world, and which should constitute retreats where men could hold undisturbed communion with God. This idea, carried out consistently, resulted in the establishment of Moravian settlements, that is, towns founded by the church, where no one who was not a member was permitted to own real estate, although strangers, complying with the rules of the community, were allowed to lease houses. A system so exclusive necessarily kept the church numerically small, although it undoubtedly was of great advantage in other respects, and served to foster the missionary zeal which has distinguished the Moravians. During the last 40 years great changes have taken place in the United States in respect to this system, and also in regard to the constitution of the church generally. The last general synod, held at Herrnhut in 1857, remodelled the constitution, and opened the way for a more general development of the resources of the church in the home field.—The Unitas Fratrum now con-

sists of three provinces, the American, continental, and British, which govern themselves in all provincial matters, but are confederated as one church in respect to general principles of doctrine and practice, and the prosecution of the foreign mission work. Each province has a provincial synod, whose executive is an elective board of bishops and elders, styled the "Provincial Elders' Conference," to which the entire management of the church in provincial things, including the appointment of pastors, is intrusted in the interval between two synods. For the general government of the three provinces and the foreign missions, there is a general synod, which meets every 10 or 12 years, and to which each province sends the same number of delegates. The executive board of the general synod is called the "Unity's Elders' Conference," and is the highest judicatory for the whole Unitas Fratrum, when that synod is not in session. In the American province there are two districts, the northern and the southern, each having a synod and a provincial elders' conference. The seat of government for the northern district is at Bethlehem, Northampton co., Pa.; and for the southern, at Salem, Forsyth co., N. C. The Moravian churches in these two districts, without exception, are now like those of other Christian denominations, the exclusive system having been given up entirely. The establishments formerly found in the settlements, and known as brethren's, sisters', and widows' houses, have likewise passed away. In the British province, the seat of government is at Ockbrook, Derbyshire. Only four of the churches of this province are settlements, and even these are gradually undergoing modification. In the continental province, the old system was strictly kept up till quite recently, when several important changes were introduced, which before long will practically do away with the exclusive polity altogether. The governing board, which is at the same time the general board for the whole "Unity" (the name by which the Unitas Fratrum is generally known in Moravian phraseology), has its seat at Berthelsdorf, a village on the estate of the same name, in Saxony, about a mile from Herrnhut; it assembles for business in the castle formerly inhabited by Count Zinzendorf, who devoted his entire property to the good of the church. On the continent of Europe a Moravian settlement still has brethren's, sisters', and widows' houses. In a brethren's house unmarried men live together, and engage in various trades and professions, the profits of which go to the church; in a sisters' house unmarried women reside, and have an opportunity of earning a livelihood by different kinds of work; a widows' house is a home for indigent or other widows, where they live comfortably at a very cheap rate. Each house has a spiritual and temporal superintendent, a common refectory and dormitory (except in the case of widows' houses),

and a prayer hall, where religious services are daily held. There is nothing monastic in the regulations by which these establishments are governed. The inmates remain in them entirely at their own option, and are almost invariably such as have no other home. A community of goods never existed at any time in a Moravian church or Moravian institution. During the Indian wars the system of "common housekeeping," as it was called, was introduced; but each person retained his own private property, and when the wars were over and the settlements secure, the system was given up. It continued only for about 20 years.—The Moravians are an evangelical church, in the fullest sense of the term, as it is commonly used in the United States. They have no confession of faith, as such; but the doctrines which they uphold are embodied in a catechism and a special litany, called the Easter morning litany, and used on Easter Sunday. Catholicity eminently marks the church, in a doctrinal point of view. Its motto may be said to be that of Augustine: "In essentials unity, in non-essentials liberty, in all things charity." The distinguishing feature of Moravian theology is the prominence given to the person and atonement of Christ. He is regarded as the centre of Christian doctrine, "in whom all the promises of God are yea and amen, and in whom we have the grace of the Son, the love of the Father, and the communion of the Holy Ghost." The Moravian ministry embraces bishops, presbyters, and deacons. Bishops only have the right to ordain. They are usually appointed by lot, in imitation of the mode of appointing the apostle Matthias. The Moravian episcopacy is not diocesan; the bishops are bishops of the whole *Unitas Fratrum*, have an official seat in the general synod, and can be appointed only by this body, or by its executive board. They do not govern the church in virtue of their office, but only when elected to the governing boards. However, they are almost invariably members of these boards by election. In other respects, their duties relate to the spiritual concerns of the church. The Moravian episcopal succession from 1467 to 1874 embraces 174 bishops. There are 17 bishops in office at present. Of these, 6 reside in Germany, 4 in England, 6 in the United States, and 1 in the West Indies. The ritual of the church is similar to that of the Protestant Episcopal. A litany is used, in several languages, in all the different parts of the Unity; and there are regular forms for infant and adult baptism, the sacrament of the Lord's supper, the rites of confirmation and ordination, burial, and marriage. Love feasts, in imitation of the apostolical agape, are celebrated; and liturgical services, particularly on occasion of church festivals, are held in many churches. The Moravians are distinguished for their church music.—The present numerical strength of the home church is as follows (1875): in the American province there are

75 churches, 8,315 communicants, and 14,737 souls; in the continental, 28 churches, 5,872 communicants, and 7,345 souls; in the British province, 40 churches, 3,249 communicants, and 5,548 souls. The whole number of communicants in the three provinces is 17,436, and of souls 27,630. Although the church is so small, it is engaged in very extensive operations. There are 5 church boarding schools in the American province (at Nazareth, Bethlehem, and Litiz, Pa., Hope, Ind., and Salem, N. C.), at which more than 600 pupils are annually educated; 15 in the British province, educating about 400 pupils every year; and 25 in the continental province, with about 1,000 pupils. Nearly all the scholars come from beyond the pale of the church. At Bethlehem, Pa., there is a college, and in connection with it a theological seminary. Similar institutions belong to the continental province. The next enterprise is that of domestic missions. These, in the United States, were commenced very recently among the German immigrants. On the continent of Europe the enterprise is extensive, and peculiarly interesting. It is called the work of the *Diaspora*, from the original Greek of 1 Peter i. 1, and has for its object the evangelization of the state churches, without proselyting their members. Hence societies within these churches are formed and regulated by the missionaries, who hold meetings for prayer and exhortation, and visit from house to house, but never administer the sacraments. There are 120 missionaries, male and female, engaged in this enterprise. It extends over Saxony, Prussia, and other German countries, Switzerland, parts of France, Denmark, Norway, Sweden, and the Russian empire. In the Russian provinces of Livonia and Esthonia the cause prospers very much, there being more than 250 chapels, and more than 60,000 members. The whole number of Diaspora members, as they are called, on the continent, is about 80,000. But the great work which chiefly engages the energies of the church, and in which all the provinces unite, is that of foreign missions. It was commenced in 1732, when Herrnhut constituted the only Moravian church, numbering about 600 souls. Since then about 2,300 missionaries, male and female, not counting the native assistants, have labored in this field. Unsuccessful missions were commenced in Lapland, among the Samoyeds, in Algeria, Ceylon, China, Persia, the East Indies, the Caucasus, Guiana, Guinea, among the Calmucks, in Abyssinia, and in Tranquebar. At present the church has missions in Greenland, Labrador, North America (among the Indians), on the Mosquito coast, in the islands of St. Thomas, St. Croix, St. John, Jamaica, Antigua, St. Christopher, Barbadoes, and Tobago, in Surinam, S. Africa, Thibet, and Australia. There are 333 missionaries in the field, not counting the native assistants; 92 regular stations, not counting the out stations; and 69,322 converts under

religious instruction, of whom 59,843 are in church fellowship, including baptized children, and the rest candidates for admission. The total number of souls connected with the *Unitas Fratrum*, not counting the *Diaspora* members, is 96,952.—See "The Moravian Manual" (Bethlehem, Pa., 1869).

MORAWA, a river of Austria. See MARCH.

MORAY, Earl of. See MURRAY.

MORAYSHIRE. See ELGINSHIRE.

MORAZAN, *Francisco*, the last president of the republic of Central America, born in Honduras in 1799, shot in Costa Rica, Sept. 15, 1842. He was secretary general of Honduras in 1824, was soon after elected chief or governor of the state, and distinguished himself both as a statesman and as a military commander. In several contests he led the liberal forces of his own and the adjacent states, with unvarying success, against the reactionary party, and finally in 1829 drove them from the city of Guatemala, for which the national congress decreed him the title of saviour of the republic. He declined the post of president, but remained commander-in-chief of the forces, and in virtue of special powers delegated to him by the congress, he expelled the archbishop of Guatemala and the monks, suppressed the convents, abolished tithes, and devoted the other property and revenues of the church to education and charity. He inaugurated various schemes of public improvement, in which he was arrested in 1832 by the invasion of the republic from Mexico by a large force under Arce, the expelled president, who was seconded by various local outbreaks of his partisans. These disturbances were promptly suppressed by Morazan, who soon after accepted the presidency. In 1836 the cholera made its appearance with extraordinary fatality. The ignorant population, more particularly the Indians, became much excited, and the clerical party proclaimed that the pestilence was due to the poisoning of the waters by the whites, liberals, and foreigners. The consequence was a general outbreak of the lower orders of the people and the Indians, under the lead of Rafael Carrera. In 1840 Morazan sought refuge in Chili, whence in 1842 he went with some followers to Costa Rica, where he was made governor of the state by acclamation. He at once began to organize an army with a view to the reestablishment of the old federation; but the plan was not popular in Costa Rica, and a revolution ensued. Morazan and his handful of adherents were surprised, and, after a brilliant struggle, compelled to surrender. Morazan was tried by a drum-head court martial and shot.

MORBIHAN, a maritime department of France, in Brittany, bordering on Côtes-du-Nord, Ille-et-Vilaine, Loire-Inférieure, Finistère, and the bay of Biscay; area, 2,625 sq. m.; pop. in 1872, 490,352. Its name is derived from a gulf on its shore, called Morbihan, or small sea. The coast is indented by numerous bays and harbors. Belle-Isle and several smaller

islands off the coast belong to this department. The northern districts are hilly, but the southern are mainly composed of extensive and fertile plains. The principal river is the Vilaine, and the department is traversed by the Blavet and the Brest and Nantes canals. The sardine fishery gives employment to more than 3,000 men. The principal minerals are iron, tin, lead, slate, and salt. There are manufactures of linen, woollens, &c. Ship building is extensively carried on. The common cereals and flax and hemp are raised, and the department is celebrated for its cider. Much attention is paid to rearing bees, and wax and honey are among the principal exports. The inhabitants of Morbihan are Bretons, and speak a dialect somewhat similar to that of the Cornish peasants in England. It is divided into the *arrondissements* of Lorient, Vannes, Pontivy or Napoléonville, and Ploërmel. Capital, Vannes.

MORDANTS (Fr., from Lat. *mordere*, to bite), materials used in dyeing and calico printing for the purpose of fixing the colors. Their action is in accordance with a twofold attraction for the coloring matter and the material of the fabric, serving as a bond of union. Substances which produce precipitates by acting upon the dyestuff, so that they may be produced within the fibres of the fabric, are also called mordants. In the strictest sense, however, they are not true mordants, but more properly speaking are components of the dyeing material, the mordant being a material that has the property of fixing the dye which has already been produced. It acts by altering the texture of the fibre in such a way as to cause it to retain the particles of the color. The principal mordants are the aluminic, stannic, and ferric salts, in which the affinity of the base and acid is comparatively weak, so that the precipitated coloring matter may be formed without much difficulty. The action of a mordant generally depends much upon the temperature at which the operation is conducted, as must be apparent from a consideration of the effects of heat upon chemical affinity, the affinity between some substances being much more affected by alterations of temperature than that between others. These reactions are also greatly modified by the nature of the fabric operated upon, and in general can only be well ascertained by experiment. Dyeing, therefore, like nearly all industrial processes, requires for its perfection the combination of theory with practice. (See CALICO PRINTING, and DYEING.)

MORDAUNT, *Charles*. See PETERBOROUGH, EARL OF.

MORDVINS, a people inhabiting eastern Russia. They form a subdivision of the *Bulgaric* or *Volgaic* family of the *Finnic* branch of the *Turanian*, *Uralo-Altaic*, or *Mongolian* races, and are related to the *Tcheremisses* and *Tchuvashes*. (See FINNS.) Their number has been estimated at 400,000, and their territory lies principally between the rivers Oka and Volga in the Rus-

sian governments of Nizhni Novgorod, Tambov, Pensa, Simbirsk, and Saratov, extending also into Samara and Astrakhan. Dialectically they may be subdivided into Mokzhas, chiefly dwelling on the banks of the Sura and Mokzha, and Ersas, occupying the shores of the Oka.—See Ahlquist, *Moksha-mordwinische Grammatik* (St. Petersburg, 1871).

MORE, Hannah, an English authoress, born in Stapleton, Gloucestershire, Feb. 2, 1745, died in Clifton, Sept. 7, 1833. She was educated at a seminary kept by her sisters in Bristol, in the direction of which she afterward became associated. At the age of 16 she composed a pastoral drama, "The Search after Happiness" (1773). In 1774 appeared her tragedy of "The Inflexible Captive," and in 1775 two legendary poems, "Sir Edred of the Bower" and "The Bleeding Rock." Garrick brought out her tragedy of "Percy" in 1777. "The Fatal Falsehood" was produced in 1779. About this time religious impressions induced Miss More to cease writing for the stage. A volume of "Sacred Dramas" (1782), "Florio," a satirical tale (1786), a "Poem on the Slave Trade" and "Thoughts on the Manners of the Great" (1788), and "Religion of the Fashionable World" (1791) were among her next productions. She began at Bath in 1795 a monthly periodical called the "Cheap Repository," consisting of short moral tales written by herself, among which was "The Shepherd of Salisbury Plain." The work attained an enormous circulation. Miss More removed to Cheddard, founded there several schools, and soon extended her charitable efforts for the education of the poor into all the surrounding country. After the appearance of her "Strictures on the Modern System of Female Education" (1799), she was invited to draw up a plan of instruction for the princess Charlotte of Wales, and produced "Hints toward forming the Character of a Young Princess" (1805). "Cœlebs in Search of a Wife," her most popular work (1809), went through 10 editions in one year. It was followed by "Practical Piety" (1811), "Christian Morals" (1812), an "Essay on the Character and Writings of St. Paul" (1815), and "Modern Sketches" (1819). In 1828 she removed from Barleywood in Gloucestershire, where she had lived for several years with her sisters, to Clifton. She accumulated by her writings about £30,000, one third of which she bequeathed for charitable purposes. The best edition of her works is in 11 vols. 16mo (London, 1853).—See "Memoirs of the Life and Correspondence of Mrs. Hannah More," by William Roberts (4 vols. 8vo, London, 1834; 2 vols. 12mo, New York, 1836), and "Correspondence of Hannah More with Zachary Macaulay" (London, 1860).

MORE, Henry, an English philosopher, born in Grantham, Lincolnshire, Oct. 12, 1614, died in Cambridge, Sept. 1, 1687. He studied at Eton, and in 1631 removed to Christ's college, Cambridge, where he took the degree of bachelor

in 1635 and of master in 1639, became a fellow of his college, and passed the remainder of his life in retirement and meditation. The rectory of Ingoldsby was resigned by him in 1642, and he became a prebendary of Gloucester in 1675, but soon resigned. In 1640 he published a philosophical poem, entitled "Psychozoia, or the Life of the Soul." At the request of Lady Conway, a Quakeress, he wrote the *Conjectura Cabalistica*, the *Philosophiæ Teutoniæ Censura*, and other works. The first of these treatises was an attempt to interpret the book of Genesis into three distinct meanings, the literal, philosophical, and mystical or divinely moral. In 1656 appeared his *Enthusiasmus Triumphatus*, a discourse on the nature, causes, kinds, and cure of enthusiasm. Among his other publications are: *Enchiridium Metaphysicum*; "The Mystery of Godliness;" "The Mystery of Iniquity;" a "Discourse on the Immortality of the Soul;" and a treatise entitled "Medela Mundi, or Cure of the World," left unfinished. His principal writings appeared in English (2d ed., 1662; 4th ed., 1712), and a complete edition of his works was published in Latin (1679). His life was written by the Rev. Richard Ward (London, 1710).

MORE, Sir Thomas, an English statesman, born in London in 1480, executed there, July 6, 1535. He was the son of Sir John More, one of the justices of the court of king's bench, was educated in Latin under Nicholas Hart, and in his 15th year was placed in the family of Cardinal Morton, archbishop of Canterbury. The aged cardinal often predicted that "whosoever shall live to see it, this child will prove a marvellous rare man." In 1497 he went to Oxford, where he studied Greek under Grocyn, and formed a lifelong friendship with Erasmus. At the university, or soon after leaving it, More composed the greater part of his English verses, and also wrote Latin epigrams (Basel, 1520), which contain proofs that he always regarded government as dependent on the consent of the people. From Oxford he passed to the study of law successively at New Inn and at Lincoln's Inn, London, at the same time delivering lectures on jurisprudence at Furnival's Inn, and on Augustine's *De Civitate Dei* at St. Laurence's church. He manifested a predilection for monastic life, but soon relinquished the project of adopting it, and resolved on marriage. Of the three daughters of Mr. Colt, a gentleman of Essex, the second seemed to him the fairest; but when he considered the slight and consequent grief to the eldest sister if the younger were preferred to her in marriage, he then "of a certain pity framed his fancy" to the former, and married her. Called to the bar, he quickly rose to professional eminence, his practice amounting to £400 a year. He was employed in nearly every important case brought before the courts, was appointed under-sheriff and judge of the sheriff's court for London and Middlesex, was elected a Burgess of the parliament under Henry VII., and his eloquence both

at the bar and in parliament was frequently successful against the claims of the crown. His effective opposition to a royal grant, causing Henry VII. to declare that "a beardless boy had disappointed all his purpose," drew a fine and imprisonment upon his father, and he himself had resolved to leave the country at the time of that monarch's death. After the accession of Henry VIII. he was still more prominently employed in public affairs. In 1514 and 1515 he was sent on embassies to the Netherlands with reference to commercial intercourse; after his return he became a privy councillor; in 1521 he was knighted and made treasurer of the exchequer; and at various times he was employed in France to manage the intrigues of Wolsey with Francis I. When parliament assembled in 1523, he was chosen speaker of the house of commons, and displayed his tact and quiet firmness when the house by its silence refused a heavy grant which Cardinal Wolsey had appeared in state to demand. In 1525 he was appointed chancellor of the duchy of Lancaster; in 1527 he accompanied Wolsey on his magnificent embassy to France; and about this time he published several learned, witty, and bitter pamphlets against the reformers. He succeeded to the lord chancellorship in 1529, after the fall of Wolsey, and in this position evaded the demand of the king for an opinion concerning his divorce from Queen Catharine. The charges that he was over-zealous in his official efforts for the suppression of heresy were partially denied in his "Apology," written in 1533. He constantly refused to lend his authority to the king's project of divorce and second marriage; and after holding the great seal for two and a half years, he determined no longer to countenance by his official position measures which he disapproved, and obtained permission to resign. In his house at Chelsea he lived in retirement, making ready for evil times. Implicated in the alleged imposture of Elizabeth Barton, the nun of Kent, whom he believed to be inspired, he was yet in the investigation treated leniently. When at length in 1534 he was required to swear allegiance to the act of succession for securing the throne to the offspring of Anne Boleyn, he refused, and was committed to the tower for misprision of treason, where he remained more than a year, with permission to receive his relatives and correspond with his friends. A deputation then waited on him to urge his acknowledgment of the royal supremacy, but he declined to answer. The council interrogated him again and again in subsequent interviews; but finally (July 1, 1535) he was brought to the bar of the high commission charged with traitorously imagining and attempting to deprive the king of his title as supreme head of the church. He was condemned, and returned to the tower. On the morning of his execution he dressed in his most elaborate costume, preserved his composure to the last, and, as the fatal stroke was

about to fall, signed for a moment's delay while he moved aside his beard, murmuring: "Pity that should be cut; that has not committed treason." There is little information concerning the style of More's oratory. In his prose writings, but a very small part of his vocabulary has become superannuated. His fragmentary "History of Richard III." (1641) is the first example of classical English prose. The work by which he is chiefly known is his *Utopia*, published in Latin (Louvain, 1516; Basel, 1518), and soon translated into English, French, Dutch, and Italian. It is an account of an imaginary commonwealth in the island of Utopia, feigned to have been discovered by a companion of Amerigo Vespucci, from whom More learns the tale. Society there is represented as free from indolence and avarice, luxury and want, oppression and intolerance; and the ideas that pervade the account are in advance of the age of the author. The best English translation is by Bishop Burnet. A collection of More's Latin works was published at Louvain in 1556, and of his English works at London in 1557. There are biographies by his son-in-law Roper (1626), Hoddenden (1652), his great-grandson Thomas More (1726), and Sir James Mackintosh ("Cabinet Cyclopædia," 1831).

MOREA. See PELOPONNESUS.

MOREAU, Jean Victor, a French general, born at Morlaix, Aug. 11, 1763, died at Laun, Bohemia, Sept. 2, 1813. He studied law at Rennes, and in 1787 was made provost of the school. He supported the parliament of Brittany in its opposition to the crown, but afterward exerted his influence against it, and became the leader of the revolutionary party at Rennes. In 1792, at the head of a battalion of volunteers, he joined the army of the north, was made a brigadier general in 1793, and general of division in 1794. Commanding the right wing of the army under Pichegru, he had an important share in the conquest of Holland. In the campaign of 1796 he was commander-in-chief of the army of the Rhine and Moselle, defeated the Austrians under the archduke Charles at Neresheim, Aug. 11, and penetrated to the centre of Bavaria; but hearing of Jourdan's defeat at Würzburg, and being aware that the archduke with all the Austrian forces in Germany was falling upon him, he made a masterly retreat in the face of two powerful armies, so that on arriving in Alsace after an orderly march of 26 days, his own force was unimpaired, and he had 18 guns and 2 standards taken from the enemy, and nearly 7,000 prisoners. In the following year he recrossed the Rhine and took the fortress of Kehl, but was stopped by the news of the preliminaries of Leoben. He was suspected on account of his friendship for Pichegru, and for 18 months remained out of service. The directorial government recalled him in the day of danger. Sent to northern Italy under Scherer, who left him in command of the French troops when

everything seemed to be lost, he was defeated by Suvaroff at Cassano, April 27, 1799, and executed a retreat from the banks of the Ad-da first to Turin, and then to Genoa, which, though less famous, is perhaps more admirable than that of 1796. He and Macdonald were superseded by Joubert, under whom Moreau consented to serve. Joubert having been killed at Novi, Moreau saved the remnant of the French army. He had in the mean while been appointed commander of the army on the Rhine. Passing through Paris, he became acquainted with Bonaparte, and assisted him on the 18th Brumaire by watching over the two reluctant directors who were kept prisoners in the Luxembourg palace. While Bonaparte was executing the campaign which ended with the victory of Marengo, Moreau, who had crossed the Rhine, April 25, 1800, had several successful contests with the Austrians, drove Gen. Kray across the Danube, won the decisive battle of Höchstädt, advanced as far as Munich, and on July 15 signed the armistice of Parsdorf. Austria showing a disinclination to a definite arrangement, a winter campaign was required. Moreau, with 100,000 men, received orders to cross the Inn and march on Vienna. On Dec. 3 he met the Austrians under the archduke John at Hohenlinden, where he won a brilliant victory. He then rapidly crossed the Inn, the Salza, and the Traun, defeated the archduke Charles at Lambach, occupied Linz on the Danube and Steyer on the Enns, and was within two days' march of Vienna when the emperor consented to the terms proposed by the first consul, and signed the treaty of Lunéville, Feb. 9, 1801. After his return to Paris, Moreau married; and yielding to the influence of his wife and mother-in-law, who persuaded him that he was not treated as he deserved to be, he gave free expression to his discontent, and was privy to, if not deeply concerned in, the conspiracy of Georges Cadoudal and Pichegru in 1804. For this he was sentenced by a court martial to two years' imprisonment, which Bonaparte commuted to exile. Moreau came to the United States, bought an estate at Morrisville, Pa., on the Delaware river, opposite Trenton, N. J., and engaged in agricultural pursuits. At the end of nine years Alexander I. of Russia invited him to return to Europe, and gave him a flattering welcome. He was induced by the czar to devise a plan for the invasion of France. He became a bosom companion of Alexander, was near him at the battle of Dresden, Aug. 27, 1813, and was advising upon a certain manoeuvre on a hill near Räcknitz, when a cannon ball from Napoleon's guard broke both his legs. He was carried on the retreat to Bohemia, and died five days later. His remains were interred in St. Petersburg. A monument was dedicated to him in Paris in 1819.—See *Vie politique, militaire et privée du général Moreau*, by A. de Beauchamp (8vo, Paris, 1814). The best account of his career is

found in Thiers's *Histoire de la révolution française* and *Histoire du consulat et de l'empire*.

MOREHOUSE, a N. parish of Louisiana, bordering on Arkansas, bounded W. by the Washita, and drained by Bartholomew and Bœuf rivers; area, 950 sq. m.; pop. in 1870, 9,387, of whom 6,375 were colored. It has an undulating surface, subject to inundation, with a fertile soil. The chief productions in 1870 were 180,032 bushels of Indian corn, 17,399 of sweet potatoes, 55,950 lbs. of butter, and 11,154 bales of cotton. There were 1,136 horses, 1,325 mules and asses, 2,510 milch cows, 5,735 other cattle, 2,570 sheep, and 10,833 swine. Capital, Bastrop.

MOREL (Fr. *morille*), the common name for *morchella esculenta*, an edible fungus found in Europe, Asia, and North America. It grows in orchards, woods, and damp pastures, preferring a heavy argillaceous soil to a sandy one, and is especially frequent on burnt soil



Morel (*Morchella esculenta*).

or where cinders have been deposited. It is usually about 4 in. high, with a white, cylindrical, smooth stem; the pileus or cap is nearly spherical, sometimes elongated, and adheres to the stem by its base; its surface is covered with a network of ribs which run together irregularly and give the cap the appearance of being pitted over its whole surface; its color is a pale buff. Morels appear in spring and early summer, and though they are less generally known than the mushroom, they are by some more highly prized. They are used in cookery for flavoring ragouts, gravies, &c., and are also eaten stewed in the same manner as mushrooms. They are found on rare occasions in the New York markets, and in England, where they are much better known, they are seldom offered for sale fresh. Unlike the mushroom, the morel preserves its flavor when dried, and in that state it is an article of commerce. The chief supply is from Germany; and as the plants are found most abundantly upon

charred soil, it was the custom of the peasants to encourage their growth by setting fire to the woods, a practice now prohibited by law. There are several other species of *morehella* in this country and Europe, all of which, according to some authors, are edible, while Berkeley says that *M. semilibera* is of doubtful reputation. There is no record in the principal European horticultural works of any attempts to cultivate this fungus, but it would not be difficult to imitate the conditions under which it grows naturally.

MORELIA, an inland city of Mexico, capital of the state of Michoacan and of a district of its own name, 125 m. W. by N. of Mexico; pop. officially estimated in 1869 at 30,000. The city stands upon a rocky hill 6,438 ft. above the sea; its streets are wide and cross each other at right angles, but are mostly disfigured by open sewers. On one side of the Plaza de los Mártires, the largest square, stands the cathedral, and the other sides are flanked by extensive arcades, the principal business centre. The construction of the houses is remarkably substantial, but few of them are of more than two stories. The cathedral has two towers about 200 ft. high. The government palace has a handsome exterior. The San Nicolas college, first built in the 16th century, and reconstructed in 1868, in the renaissance style, is one of the finest edifices in the republic. The numerous convents and nunneries were suppressed in 1859, and the buildings are for the most part in ruins. Water is supplied by an aqueduct, constructed in 1788, 3 m. long, with vast and lofty arches, and of imposing aspect. The bull ring is one of the best and most spacious in Mexico. There are two asylums or houses of refuge, one for each sex, a hospital, a fine prison, two or three barracks, and two cemeteries. Besides the college above mentioned, including departments of law, medicine, pharmacy, and agriculture, there is a considerable number of schools of various grades. The manufacturing industry is limited to cotton and woollen fabrics, of which there are two factories, one having 68 looms and employing 200 hands; and *guayabate*, a delicate fruit preserve, extensively exported to Mexico. —The city was founded in 1541, and received the name of Valladolid, which in 1828 was changed to that of Morelia, in honor of the patriot José Maria Morelos, who as well as Iturbide was a native of the place. In spite of a somewhat insalubrious climate, periodical inundations, and occasional earthquakes, Morelia has rapidly increased in extent and importance; in 1856 it had only 30 streets, and now has 99. It was made a bishopric in 1863.

MORELLA, *Count de*. See CABRERA, RAMON.

MORELOS, an inland state of Mexico, bounded by the state and the federal district of Mexico, Puebla, and Guerrero; area, 1,887 sq. m.; pop. in 1868, 121,098; in 1873, according to the annual report of the ministry of public works, 147,039. This state, which was for-

merly included in that of Mexico, forms a part of the S. E. slope of the central table land, and has a mean elevation of about 4,500 ft. above the sea. It is very mountainous, and the volcano of Popocatepetl, one of the highest points, if not the culminating point, of North America, is on the N. E. boundary; but the highest peaks are separated by plains of remarkable fertility. Almost the whole country is of volcanic formation. The cave of Caca-huamilpa, near the village of the same name, is reported one of the most curious in the world; the entrance is formed by an arch 75 ft. high and 150 wide; in the interior are vast natural divisions or compartments called *alones*, where snow-white stalactites and stalagmites abound, resembling obelisks, palms, &c. Numerous streams water the plains, but the Cuernavaca and Cuantla, tributaries of the Amacusaque, are the only considerable rivers. The climate, mild in the north, is extremely hot and insalubrious in the south; malignant fevers and endemic dysentery are the prevailing maladies. The staple productions are the sugar cane and several varieties of exquisite fruits, immense gardens being laid out in various parts of the state for their cultivation. There were 22 silver mines in operation in 1873, and gold, quicksilver, cinnabar, lead, chalk, and kaolin are produced. The principal industries are the manufacture of sugar, molasses, and rum of superior quality. The sugar manufactured in 1873 amounted to 20,478,200 lbs., and the molasses to 3,632,211 gallons. There were in the state 184 public schools, 32 of which were for females, with an aggregate attendance of 7,271, exclusive of 36 enrolled in the state literary institute at Cuernavaca. Morelos is divided into five districts, and the chief towns are Cuernavaca, the capital, Cuantla de Morelos, Yau-tepec, Jonacatepe, and Tete-Cola.

MORELOS, or **Montemorelos**, a city of Mexico, capital of a district of the same name, in the state of Nuevo Leon, 70 m. S. E. of Monterey; pop. about 9,000. The town is 2,000 ft. above the sea. The old portion is ruinous, but the modern part has wide and regular streets, substantial buildings, and courtyards filled with trees and flowers. Streams of pure water flow through the streets. There are several churches, three public schools, and manufacturing of sugar, rum, agricultural implement, hardware, silver, and hats. The original name of the city was San Mateo del Pilon.

MORELOS, **José Maria**, a Mexican revolutionist, born in 1780, shot in the city of Mexico, Dec. 22, 1815. He was curate of Nocupetaro in Valladolid, and in October, 1810, joined the insurgent chief Hidalgo against the Spaniards, receiving a commission to act as captain general of the provinces on the S. W. coast. He set out with five negroes to conquer Aca-pulco, which was strongly garrisoned. On his march he was joined by about 1,000 men, chiefly negro slaves, with whom under cover

of night he surprised and signally defeated the Spaniards, Jan. 25, 1811. His army at length acquired discipline, and he encountered the Spanish army at Cuautla Amilpas, Feb. 19, 1812, and defeated it after a hard-fought battle, in which the royalists lost 500 men. A second army was sent against him, and for several weeks he was besieged in Cuautla, from which he skilfully withdrew his troops May 2, in the face of a greatly superior force. Subsequently he won several victories, captured Orizaba, Tehuacan, and Oajaca, and at length compelled Acapulco to surrender, Aug. 30, 1813. In December of the same year he marched against Valladolid, but was defeated there by Iturbide with great loss. From this time he suffered a succession of defeats, till on Nov. 16, 1815, he was taken prisoner after a gallant resistance against an overwhelming force, and was carried to Mexico, tried, and executed. He died with the utmost composure.

MORETO, Agustin, a Spanish dramatist, born about 1600, died in Toledo, Oct. 28, 1669. He was prominent as a writer for the stage until the last 12 years of his life, which he passed as rector of the hospital *del refugio* of Toledo. He was a friend and imitator of Lope de Vega and Calderon. His works comprise a few religious and heroic plays, and some serious dramas. His most popular comedy, *Desden con el desden* ("Disdain met with Disdain"), is reckoned among the four classic productions of the Spanish drama, and was adapted for the French stage by Molière (*La princesse d'Élide*), for the Italian by Carlo Gozzi (*La principessa filosofa, o il Contraveleno*), and for the German by Joseph Schreyvogel (West), under the title of *Donna Diana*. The most nearly complete edition of his comedies was issued between 1676 and 1703.

MORETTO, II. See **BOUVICINO**.

MORFIT, Campbell, an American chemist, born in Herculaneum, Mo., in 1820. He studied at Columbian college, Washington, D. C., and subsequently devoted himself to the study of chemistry in the laboratory of Prof. James C. Booth of Philadelphia. He then engaged in the manufacture of commercial chemicals. In 1848 he became co-editor with Prof. Booth of the "Encyclopædia of Chemistry." He published numerous scientific papers, and also wrote a report to the United States ordnance department on gun metal. For the investigations to which this latter refers he established a laboratory at the Pikesville arsenal, Md., and he originated the chemical department of the Maryland institute. From 1854 to 1858 he was professor of analytical and applied chemistry in the university of Maryland, which post he resigned to remove to New York; and since 1864 he has resided in London, England. His principal works are: "Applied Chemistry in the Manufacture of Soaps and Candles" (Philadelphia, 1847); "Chemical and Pharmaceutical Manipulations" (1848); "A Report of the Progress of the Chemical Arts," prepared

with Prof. Booth for the Smithsonian institution (1851); "Perfumery, its Manufacture and Use" (1852-5); "Oleic Soaps" (London and New York, 1871); and "Mineral Phosphates" (1873). The last two are elaborately illustrated.

MORGAGNI, Giovanni Battista, an Italian anatomist, born in Forlì, Feb. 25, 1682, died in Padua, Dec. 6, 1771. He took his degree of M. D. at Bologna, in 1711 became professor of the theory of physic at Padua, and in 1715 professor of anatomy. He is regarded as the founder of pathological anatomy. His works include *Adversaria Anatomica* (3 vols. 4to, Bologna and Padua, 1706-'19), enlarged and published under the title of *Adversaria Omnia* (6 vols., Padua, 1741); and *De Sedibus et Causis Morborum per Anatomiam Indagatis* (2 vols. fol., 1761; 6 vols., Leipsic, 1827), translated into various languages.

MORGAN, the name of counties in 10 of the United States. **I.** A N. E. county of West Virginia, bordering S. W. on Virginia, separated from Maryland by the Potomac, and drained by Cacapon river; area, 350 sq. m.; pop. in 1870, 4,315, of whom 116 were colored. The surface is mountainous, and the soil light and unproductive except in the valleys. There are large deposits of iron and coal. Berkeley Springs in this county is one of the oldest watering places in the United States. The Baltimore and Ohio railroad passes through the county. The chief productions in 1870 were 27,697 bushels of wheat, 58,142 of Indian corn, 19,835 of oats, 10,915 of potatoes, 7,564 lbs. of wool, 41,183 of butter, and 1,996 tons of hay. There were 882 horses, 1,112 milch cows, 1,456 other cattle, 2,683 sheep, and 2,552 swine. Capital, Bath. **II.** A central county of Georgia, bounded E. by Apalachee and Oconee rivers, and drained by their branches; area, 272 sq. m.; pop. in 1870, 10,696, of whom 7,058 were colored. The surface is undulating, and the soil, based on limestone, is fertile. Small quantities of gold have been found, and there are large granite quarries. The county is intersected by the Georgia railroad. The chief productions in 1870 were 19,820 bushels of wheat, 129,948 of Indian corn, 14,325 of oats, 8,019 of sweet potatoes, 38,968 lbs. of butter, and 4,868 bales of cotton. There were 636 horses, 721 mules and asses, 1,144 milch cows, 1,975 other cattle, 1,363 sheep, and 3,762 swine. Capital, Madison. **III.** A N. county of Alabama, bounded N. by the Tennessee river; area, 720 sq. m.; pop. in 1870, 12,187, of whom 3,358 were colored. The surface is mountainous and the soil generally fertile. The Memphis and Charleston railroad passes through the N. W. part. The chief productions in 1870 were 23,336 bushels of wheat, 333,332 of Indian corn, 17,701 of oats, 19,902 of sweet potatoes, 4,389 bales of cotton, 6,747 lbs. of wool, 70,886 of butter, and 11,877 gallons of sorghum molasses. There were 2,462 horses, 660 mules and asses, 2,944 milch cows, 924 working oxen, 3,977 other cattle, 4,962 sheep, and 14,844

swine. Capital, Somerville. **IV.** A N. E. county of Tennessee, drained by the head streams of Emory's river; area, 640 sq. m.; pop. in 1870, 2,969, of whom 101 were colored. The surface is diversified by mountains covered with large forests. There are extensive beds of coal. The chief productions in 1870 were 52,642 bushels of Indian corn, 15,548 of oats, 9,910 of potatoes, 7,944 lbs. of tobacco, 9,197 of wool, 29,225 of butter, and 485 tons of hay. There were 515 horses, 940 milch cows, 2,351 other cattle, 4,312 sheep, and 9,532 swine. Capital, Wartburg. **V.** An E. county of Kentucky, intersected by Licking river; area, 806 sq. m.; pop. in 1870, 5,975, of whom 44 were colored. The surface is hilly, and the soil in the valleys is rich. Timber is abundant, and iron, coal, alum, copperas, and oil springs are found. The chief productions in 1870 were 10,479 bushels of wheat, 226,751 of Indian corn, 34,139 of oats, 17,678 of potatoes, 16,800 lbs. of tobacco, 20,960 of wool, 89,717 of butter, and 1,035 tons of hay. There were 1,502 horses, 662 milch cows, 1,099 working oxen, 2,349 other cattle, 10,102 sheep, and 8,036 swine. Capital, West Liberty. **VI.** A S. E. county of Ohio, intersected by Muskingum river; area, 360 sq. m.; pop. in 1870, 20,363. It has an uneven surface, and a rich soil based on limestone. Large quantities of salt are procured. The chief productions in 1870 were 192,701 bushels of wheat, 613,837 of Indian corn, 137,546 of oats, 71,821 of potatoes, 486,125 lbs. of tobacco, 313,372 of wool, 593,454 of butter, and 20,400 tons of hay. There were 6,637 horses, 5,795 milch cows, 11,058 other cattle, 78,009 sheep, and 16,468 swine; 2 manufactories of agricultural implements, 7 of carriages and wagons, 2 of coal oil, 12 of salt, 4 tanning and currying establishments, 3 saw mills, and 11 flour mills. Capital, McConnellsville. **VII.** A central county of Indiana, drained by the W. fork of White river and its branches; area, 453 sq. m.; pop. in 1870, 17,528. The surface in the south is uneven, in other parts level, and the soil is fertile. It is traversed by the Indianapolis and Vincennes and the Cincinnati and Martinsville railroads. The chief productions in 1870 were 328,131 bushels of wheat, 1,188,289 of Indian corn, 63,439 of oats, 48,402 of potatoes, 11,127 lbs. of tobacco, 61,471 of wool, 229,355 of butter, and 8,183 tons of hay. There were 6,142 horses, 4,375 milch cows, 9,560 other cattle, 20,902 sheep, and 34,606 swine; 20 manufactories of carriages, 2 of furniture, 9 of saddlery and harness, 1 of woollen goods, 1 wool-carding establishment, 32 saw mills, 6 tanneries, 4 currying establishments, and 9 flour mills. Capital, Martinsville. **VIII.** A W. county of Illinois, bounded N. W. by the Illinois river and drained by several creeks which afford water power; area, 550 sq. m.; pop. in 1870, 28,463. The surface consists chiefly of rich level prairies, diversified by small groves. The soil is a deep black loam; coal is abundant. It is traversed by the Peoria,

Pekin, and Jacksonville, the Great Western, and several other railroads. The chief productions in 1870 were 375,719 bushels of wheat, 3,198,835 of Indian corn, 198,724 of oats, 68,105 of potatoes, 77,156 of wool, 295,798 of butter, and 29,671 tons of hay. There were 10,330 horses, 5,648 milch cows, 30,809 other cattle, 15,040 sheep, and 44,583 swine; 12 manufactories of agricultural implements, 3 of boots and shoes, 5 of brick, 28 of carriages, 7 of furniture, 8 of saddlery and harness, 2 of cigars, 2 of woollen goods, and 11 flour mills. Capital, Jacksonville. **IX.** A central county of Missouri, bounded S. in part by Osage river and drained by some of its tributaries; area, 648 sq. m.; pop. in 1870, 8,434, of whom 807 were colored. The surface is diversified and in some places well wooded. The soil is generally fertile. Lead, coal, and limestone are found. The Missouri Pacific railroad skirts the N. border. The chief productions in 1870 were 83,123 bushels of wheat, 228,175 of Indian corn, 138,259 of oats, 16,424 of potatoes, 23,468 lbs. of wool, 41,833 of butter, and 2,909 tons of hay. There were 3,409 horses, 1,063 mules and asses, 2,771 milch cows, 5,630 other cattle, 10,366 sheep, and 11,493 swine. Capital, Versailles. **X.** A N. E. county of Utah, watered by Weber river and its tributaries; area, 600 sq. m.; pop. in 1870, 1,972. It is crossed by the Union Pacific railroad. The chief resources are agricultural, but coal and iron are believed to exist. Gold mines have been recently opened. The chief productions in 1870 were 12,960 bushels of wheat and 3,950 of potatoes. The value of live stock was \$40,490. There were 7 saw mills. Capital, Morgan.

MORGAN, Daniel, an American general, born in New Jersey in 1736, died in Winchester, Va., July 6, 1802. In early life he removed to Frederick (now Clarke) co., Va. In 1755 he joined the expedition of Braddock as a teamster, and for some real or fancied indignity to a British officer received 500 lashes. He also received a painful wound which disfigured his countenance for life. He worked as a farmer till the outbreak of the revolution, when, in command of a company of riflemen, he started for Boston, reaching the American camp, after a march of 600 miles, in three weeks. In December, 1775, he accompanied the expedition of Arnold to Quebec, and in the attack on that city was taken prisoner. Soon after his release, toward the close of 1776, he was appointed colonel of a rifle regiment. During Washington's retreat through New Jersey in 1776 and the campaign in the same state in 1777, he rendered valuable services, and in the summer of the latter year joined Gates, then in command of the northern army. In the battle of Bemus's heights Morgan's riflemen took a distinguished part. Continuing in active service in the north until the summer of 1780, he was then made brigadier general and transferred to the southern army. He gained a decisive victory over Tarleton at the Cowpens, Jan. 17, 1781,

for which he received a gold medal from congress, and followed it up by a series of well conceived manœuvres which seriously embarrassed Cornwallis. Before the close of the campaign he was compelled by ill health to retire to his home in Virginia. He aided in quelling the whiskey insurrection in Pennsylvania in 1794, and was a member of congress from 1795 to 1799.

MORGAN, Sir Henry, a British buccaneer, born about 1637, died in Jamaica in 1690. He was the son of a farmer in Wales, became a sailor, and for many years maintained his position among the West India islands as chief of a host of pirates, composed of adventurers from all the nations of Europe. From his strongholds, one of which was the island of St. Catharine, he made many successful descents upon the Spanish settlements in his vicinity, and at sea captured many rich prizes. The most daring of these expeditions was that in which he captured and sacked Portobello and Panama, amassing a large fortune. (See *BUCCANEERS*.) He afterward settled in Jamaica, where he was made a marine commissary and knighted by Charles II.

MORGAN, Lewis Henry, an American author, born in Ledyard, Cayuga co., N. Y., Nov. 21, 1818. He graduated at Union college in 1840, and studied law at Rochester, where he began to practise in 1844, and where he still resides. In 1864 he retired from practice. In 1851 he published "The League of the Iroquois," a full and accurate account of the Six Nations and their institutions. His researches among the Iroquois led him to observe their peculiar system of family relationship, which he found prevailed also among the tribes of the west, and of which in his ethnological studies he discovered unmistakable traces among the barbarous nations of the old world. This led him to institute investigations in all parts of the globe by means of letters and circulars addressed to missionaries and to United States ministers and consuls. The results of this correspondence were embodied in "Systems of Consanguinity and Affinity of the Human Family," published by the Smithsonian institution in 1870, which Sir John Lubbock pronounced "one of the most valuable contributions to ethnological science which have appeared for many years." In 1868 Mr. Morgan published "The American Beaver and his Works," the result of much observation of the beaver in the neighborhood of Lake Superior. In 1861 he was a member of the New York assembly, and in 1868-'9 a state senator.

MORGAN. I. Sydney (OWENSON), lady, an Irish authoress, born about 1783, died in London, April 13, 1859. Her father was an actor, and a man of considerable literary acquirements. In 1797 she published a volume of poems, followed by two tales, "St. Clair" (1804) and "The Novice of St. Dominick" (1805), and a novel, "The Wild Irish Girl" (1806), of which seven editions were printed in two years. In

1807 appeared her "Patriotic Sketches of Ireland" and "The Lay of an Irish Harp, or Metrical Fragments." In March of the same year her comic opera, "The First Attempt, or the Whim of a Moment," was brought out, with great success in the Theatre Royal, Dublin. In 1809 she published "Woman, or Ida of Athens;" and in 1811 "The Missionary." In 1812 she was married to Sir Thomas Charles Morgan, with whom she subsequently travelled over various parts of Europe, residing for considerable periods in France and Italy. Among the results of her travels were a review of the social state of France (4to, London, 1817), and a similar work on Italy (2 vols. 8vo, 1821), both of which caused much controversy. The popularity of these works introduced the authoress to the fashionable and literary circles of England. Among her remaining works were her novels, "O'Donnell" (1814), "Florence Macarthy" (1816), "The Life and Times of Salvator Rosa" (1824), "Absenteeism" (1825), and "The O'Briens and the O'Flahertys" (1827); "Book of the Boudoir," containing several autobiographical sketches (1829); "Dramatic Scenes from Real Life" (1833); "The Princess, or the Béguine," written during a visit to Belgium (1835); "Woman and her Master" (1840); and "Passages from my Autobiography" (1858). Lady Morgan was one of the most brilliant conversationalists of her time. She passed her last years at her residence in London, in the enjoyment of a pension of £300.—See W. J. Fitzpatrick's "Friends, Foes, and Adventures of Lady Morgan" (Dublin, 1859). **II. Sir Thomas Charles**, an English author, husband of the preceding, born in London about 1783, died there, Aug. 28, 1843. He was educated at Eton and Cambridge, and in 1809 took the degree of M. D. He removed to Ireland, having a place under government as a commissioner of the Irish fisheries, was knighted in 1811, and in 1812 married Miss Owenson. Soon afterward he relinquished his profession for the pursuit of literature, and was an industrious contributor to periodicals. He is the author of "Sketches of the Philosophy of Life" (1818), and "Sketches of the Philosophy of Morals" (1822), and published in conjunction with his wife a collection of essays and miscellanies entitled "The Book without a Name" (1841). He furnished four appendices to Lady Morgan's first work on France.

MORGAN, William. See *ANTI-MASONRY*.

MORGANA. See *FATA MORGANA*.

MORGANATIC MARRIAGE (Ang.-Sax. *morgan gifu*, Ger. *Morgengabe*, morning gift or dowry), the term for a marriage concluded between a man of superior and a woman of inferior rank, in which it is stipulated that the latter and her children shall be entitled neither to the rank nor to the possessions of the husband, the dowry (morning gift) being in lieu of all other privileges. Marriages of this kind are not infrequent in the princely houses of Germany, and one of the most noted was that of King

Frederick William III. of Prussia with the countess Auguste von Harrach, who thereupon received the title of princess of Liegnitz.

MORGARTEN, a hill in Switzerland, about 2 m. W. of Rothenthurm, on the margin of the lake of Egeri, and on the E. border of the canton of Zug, memorable as the scene of the battle of Nov. 16, 1315, in which a body of 1,400 Swiss mountaineers from Schwytz, Uri, and Unterwalden, ill armed and undisciplined, totally vanquished an Austrian army of 20,000 under the duke Leopold. The hill overlooks a narrow pass between it and the lake. When the Austrians had entered this pass, a portion of the Swiss hurled down upon them immense masses of rock, which killed many and threw the cavalry into confusion; the remainder of the Swiss, stationed at the end of the pass, then charged them, and but few escaped. This was the first victory achieved by the Swiss in their struggle for freedom. A chapel stands at the foot of the hill, in which service is performed annually on the anniversary of the battle.

MORGENSTERN, *Christian*, a German painter, born in Hamburg in 1805, died Feb. 26, 1867. His parents were poor, and he began life as assistant of an exhibitor of panoramas. In 1823 he was admitted to the school of painting of Bendixen, and in 1827 he exhibited his first work, "Oaks near a Swamp," which procured for him a small stipend from the government. He spent some time in Holstein, explored Norway, attended the academy of fine arts at Copenhagen, and settled in Munich in 1830, choosing the "Heath of Lüneburg" as the theme of his first work in that city. He produced exquisite landscapes of the mountains of Berchtesgaden and Salzburg, of the romantic castles of Alsace and the Vosges mountains, of Lakes Starnberg and Chiem, and of Heligoland. His pictures of moonlight and stormy nights on Heligoland are regarded as his masterpieces. Shortly before his death he exhibited in Paris a new painting of the heath of Lüneburg. He also excelled in etching.

MORGHEN, *Raffaele Sanzio*, an Italian engraver, born in Florence, June 19, 1758, died there, April 8, 1833. He was instructed by his father, an engraver, and at 20 years of age executed a series of seven plates representing masks from the carnival of Naples of 1778. He was then placed in the school of Volpato in Rome, and in 1781 married the only daughter of his master. In 1787 he produced his engraving of Guido's "Aurora." He visited Naples in 1790, and removed in 1793 to Florence, where he opened a public school of engraving. His first important work in Florence was the print of Raphael's *Madonna della seggiola*, and in 1795 he commenced the *Madonna del sacco* of Andrea del Sarto, and the "Transfiguration" of Raphael, the latter his most elaborate work, completed in 1812. But this is considered less meritorious than his print of the "Last Supper" after Leonardo da Vinci, the early impres-

sions of which (1800) are among the most precious productions of his graver. According to his pupil Nicolò Palmerini, to whom he gave impressions of every plate from the first outline to the finished proof, Morghen executed 73 portraits, many of which were of living personages besides the great poets and painters of Italy, 47 Biblical and religious pieces, 44 historical and mythological pieces, 24 views and landscapes, and 13 vignettes and crests. The Palmerini collection of his prints was purchased by the duke of Buckingham for £1,200.

MORGUE (from the Languedocian *morga*, a repulsive face), a place for the exhibition of dead bodies of unknown persons, with a view to their identification. Such establishments existed in Paris as early as the 17th century, in connection with prisons. The one in the Châtelet was succeeded in 1804 by a separate establishment, which was enlarged in 1830; but this proving inadequate, another was opened in 1866 close by the Seine, behind the cathedral of Notre Dame. It consists of a central pavilion and two wings. The dead are placed inside a glazed partition, on slabs of marble, and streams of water and other means are employed to delay decomposition. The average period of exhibition is 24 hours, and the greater number of the bodies are recognized. When there is evidence of death by violence, the bodies are examined in the dissecting room. The burial of the unrecognized and poor is at the public expense in special lots in the cemeteries. The effects not claimed by relatives are retained for six months. The following table shows the number exposed in ten years:

AGES.	Males.	Females.	Total.
5 to 25.....	505	115	620
25 to 45.....	1,050	192	1,242
45 to 65.....	599	163	762
65 to 85.....	125	53	183
* Total.....	2,279	523	2,807

Besides these, there were 94 fragments, 296 fetuses, and 197 new-born infants; the number of the last has greatly increased of late years, in consequence of the suppression of deposit boxes in foundling hospitals. In the whole number there were 1,766 suicides, most of them recovered from the Seine. A majority of these were natives of Paris, of the poorest classes. The annual average is about 250 adult males and 50 females, but is much larger in time of epidemics and disturbances. It has been exceptionally large since the Franco-German war, the suicides increasing from 567 in 1872 to 660 in 1873, and to nearly 1,000 in 1874.—The morgue in New York was established in June, 1866. It is on the grounds of Bellevue hospital, and is under the charge of the warden of the hospital, a keeper, and an assistant. As soon as a corpse is brought in, a full account of its recovery, when and where found, a description, and other particulars are

recorded. Notice is sent to the coroner, and if there are indications of a violent death the case is reported to the superintendent of police. Recognized bodies, by permission of the coroner, are removed by friends; those unrecognized are exposed on marble slabs, under streams of water, for 72 hours, or less at the discretion of the warden. Photographs are taken for the inspection of persons in search of missing friends. The clothing is exhibited 30 days, and kept a year. Unrecognized bodies are buried in the city cemetery on Hart's island, and numbers and records permit their identification and removal. In no case is a corpse devoted to dissection. On the first day of each month the warden makes a detailed report of all bodies, identified or not, to the commissioners of public charities and correction. From June, 1866, to Oct. 19, 1874, 1,283 bodies were received, of which more than one half were recognized and removed by friends. Nearly three fourths were bodies of persons drowned, a large proportion of them while bathing. From January to October, 1874, there were brought from the rivers to the morgue 127 males and 17 females, of whom 101 males and 11 females were found in May, June, July, and August, leaving but 26 males and 6 females for the five colder months. But in New York, as in Paris and elsewhere, the warm months are selected by suicides who drown themselves. A considerable number of those who are drowned purposely or by accident or are murdered and thrown into the East or North river, are not recovered, but are carried away by the tide. Of infants dead from neglect or other causes at time of birth, and of fetuses, only a few are taken to the morgue.—The morgue in Brooklyn, N. Y., was erected in 1870 at a cost of \$25,000, and is the most complete building of the kind in the country. It is in Willoughby street, in the rear of the jail, and, with every convenience for the exhibition and preservation of bodies, contains rooms for post-mortem examinations, a large jurors' court room, which can be used as a chapel for funerals, and residence rooms for the keeper and his family. It is under the supervision of the coroners. The rules and regulations are substantially those of the New York morgue. Minute descriptions of the unrecognized are published in two of the city newspapers. In no case is a corpse given up for dissection till every means of identification has been exhausted. The number of bodies averages 150 a year, more than half of them drowned, and there is in addition an annual average of about 50 dead infants and fetuses. The number of bodies recognized and removed by friends in four years is as follows: 62 in 1871, 91 in 1872, 142 in 1873, and 45 to Sept. 1, 1874. In 1874, to the same date, 101 bodies, some of them recognized, were buried from the morgue at public expense.—The morgue in Chicago, Ill., is on the grounds of the Cook county hospital, and was opened

June 1, 1872. It is in charge of the warden of the hospital, under the supervision of the superintendent and medical director of public charities. The rules and regulations are nearly identical with those of the New York morgue. A law which went into effect July 1, 1874, permits the devotion of unrecognized bodies to dissection. The receipt of bodies has been as follows: 70 males and 7 females in 1872, 94 males and 9 females in 1873, and 102 males and 11 females to Oct. 5, 1874. Of these, 32 were infants dead from neglect or other causes at time of birth, and there were in addition 6 fetuses. Of 261 deaths in three years, 105 were caused by drowning, 52 by railway accidents, 23 by suicide, and 81 resulted from other causes; and 212 bodies were recognized.—The morgue in Boston, Mass., was opened in 1851, near the Massachusetts general hospital, and is in charge of an undertaker. A coroner is called to determine whether deaths are by violence, suicide, or accident. Bodies are exposed 48 hours or longer, and descriptions are recorded, garments exhibited and preserved, and notices inserted in the newspapers, but no photographs are taken. Unclaimed bodies are buried at public expense. Statute law forbids devoting unknown bodies to dissection. Reports are made to the city registrar. About 100 bodies are annually received, and about two thirds of them are recognized. No infants are sent to the morgue, unless inquests are necessary; they are delivered to the city undertaker for burial.—An ordinance adopted in St. Louis, Mo., in September, 1874, provides for the establishment of a morgue in that city.

MORHOF, Daniel Georg, a German scholar, born in Wismar, Feb. 6, 1639, died in Lübeck, June 30, 1691. He became professor of poetry at Rostock in 1660, and at Kiel in 1665, professor of history in 1673, and librarian in 1680. He was a voluminous author, and his principal work, *Polyhistor*, part of which appeared in his lifetime (Lübeck, 1688), was published complete in 1704, and was for a long time a standard work on universal literature.

MORIAH, Mount. See JERUSALEM.

MORTIER, James, an English author, born about 1780, died in Brighton, March 30, 1849. He studied the oriental languages, spent about six years (1810-'16) in Persia as secretary of legation and minister plenipotentiary, and published "Travels in Persia, Armenia, and Asia Minor to Constantinople" (London 1812); "A Second Journey through Persia, Armenia, and Asia Minor" (1818); and a series of novels, the most interesting of which is "The Adventures of Hajji Baba" (5 vols., 1824-'8). Among his other works are "Zohrab, or the Hostage" (1832), "Ayesha, the Maid of Kars" (1834), and "The Mirza" (1841), all illustrations of Persian life.

MÖRIKE, Eduard, a German poet, born at Ludwigslust, Württemberg, Sept. 8, 1804. He attended the gymnasium of Stuttgart, prepared himself at Urach and Tübingen for the minis-

try, and was for a while a pastor. But ill health impelled his retirement, and he was a teacher at Stuttgart till 1866. He is one of the best of the Swabian poets, and has made excellent translations of Anacreon and Theocritus. His works include *Maler Nolten*, a novel (Stuttgart, 1832); *Gedichte* (1838; 4th ed., 1867); *Idylle vom Bodensee* (1846; 2d ed., 1856); *Das Stuttgarter Hutzelmännlein*, a fairy tale (1853); *Vier Erzählungen*; and *Mozart auf der Reise nach Prag*, a novel (1856). Lachner set to music his opera *Die Regenbrüder*, and Hetsch and F. Kauffmann many of his songs and ballads.

MORLAKS, the name of a portion of the Slavic population of Dalmatia and the adjoining maritime districts of Austro-Hungary. They are skilful mariners, and form a large portion of the sailors in the Austrian navy. The coast of the Adriatic between Carlopago and Zengg is from them called Morlaca, and the strait between it and the islands of Veglia, Arbe, and Pago the strait of Morlaca.

MORLAND, George, an English painter, born in London about 1764, died there, Oct. 29, 1804. His father was an artist, under whose direction he made pictures and drawings for sale. When 21 he left his father's house and pursued his art alone, reaching the full maturity of his powers about 1790, after which period he gave himself up to intemperance and profligacy. During the last few years of his life he was seldom sober, and painted only to supply his actual necessities. Many of his later works were executed in sponging houses, in one of which he died. His subjects were generally selected from low life, and he acquired an astonishing skill in painting domestic animals, especially pigs. He was also very successful in delineating the more common species of English landscape. His execution deteriorated greatly toward the close of his life, but his pictures were nevertheless in such demand that a regular manufactory of imitations of them was established by his brother Henry.

MORLEY, Henry, an English author, born in London, Sept. 15, 1822. He was sent to a Moravian school at Newwied on the Rhine, and graduated at King's college, London, where he established and edited the "King's College Magazine." He practised medicine in Shropshire from 1843 to 1848. Beginning in 1847, he has published numerous papers on public health. From 1851 to 1857 he was Dickens's assistant in editing "Household Words," and from 1856 to 1859 joint editor of the London "Examiner," of which he was sole editor from 1859 to 1864. In 1859 he became professor of English literature in King's college, and in 1865 in University college. He was the most active promoter of the association formed in 1869 for the education of women in connection with the latter institution. His principal publications in book form are: "The Dream of the Lily Bell," tales and poems (1845); "Sunrise in Italy," poems, and "Tracts upon

Health, for Cottage Circulation" (1847); "A Defence of Ignorance" (1851); "Life of Bernard Palissy of Saintes" (2 vols., 1852); "Life of Jerome Cardan" (1854); "Life of Henry Cornelius Agrippa" (1856); "Gossip and Memoirs of Bartholomew Fair" (1857); "A History of English Literature" (2 parts published, 1864 and 1867, the first devoted to writers before Chaucer, the second reaching from Chaucer to Dunbar); "Steele and Addison's Spectator, original and corrected texts" (1868); "Tables of English Literature" (1870); "Clément Marot, and other Studies" (1871); and "A First Sketch of English Literature" (3 vols., 1873).

MORLEY, John, an English author, born in Blackburn, Lancashire, Dec. 24, 1838. He graduated at Lincoln college, Oxford, in 1859, early became a contributor to the "Saturday Review," and in 1867 succeeded George Henry Lewes as editor of the "Fortnightly Review." He published "Edmund Burke, a Historical Study," in 1857, "Critical Miscellanies," including essays on De Maistre, Condorcet, Carlyle, and Byron, in 1871, and in the latter year also a volume on Voltaire. In April, 1872, he delivered at the London royal institution a lecture on Rousseau, which was afterward elaborated into two volumes (1873). In 1873 he delivered a series of lectures on "The Limits of the Historic Method." In that year also he was active in resisting the educational system introduced by the Gladstone government, because of its denominational character, and published "The Struggle for National Education." His latest work is "On Compromise" (1874).

MORLEY, Thomas, an English composer, died in London at an advanced age about 1604. He graduated as a bachelor of music at Oxford in 1588, and was made gentleman of Queen Elizabeth's chapel in 1592. He was a pupil of William Birde and a student of the forms of the Italian madrigal writers. His works consist of canzonets, madrigals, anthems, and church services. In imitation of Giovanelli, who had employed 37 of the most celebrated Italian composers to write madrigals in honor of the Virgin Mary, Morley obtained from English composers 24 madrigals in praise of Queen Elizabeth under the name of Oriana, entitling the collection "The Triumphs of Oriana, to five and six voices, composed by divers several authors, newly published by Thomas Morley, Bach. of Musicke and Gentleman of her Majesty's honorable Chapell" (1601). Among the composers represented in this collection were John Milton, father of the poet, Wilbye, and Benet. Morley wrote also a treatise of much value entitled "A Plaine and Easie Introduction to Practical Musicke."

MORMONS, or **Latter Day Saints**, a sect founded by Joseph Smith, who was born at Sharon, Vt., in 1805, and was killed at Carthage, Ill., in 1844. (See SMITH, JOSEPH.) According to his own account, Smith at about the age of 15, while living with his father, who was a

farmer in Ontario (now Wayne) co., N. Y., began to have visions. On the night of Sept. 21, 1823, the angel Moroni appeared to him three times, informing him that God had a work for him to do, and that a record written upon gold plates, and giving an account of the ancient inhabitants of America and the dealings of God with them, was deposited in a particular place in the earth (a hill in Manchester, Ontario co., N. Y.), and, with the record, two transparent stones in silver bows like spectacles, which were anciently called the Urim and Thummim, on looking through which the golden plates would become intelligible. On Sept. 22, 1827, the angel of the Lord placed in Smith's hands the plates and the Urim and Thummim. The plates were nearly 8 in. long by 7 in. wide, and a little thinner than ordinary tin, and were bound together by three rings running through the whole. Altogether they were about 6 in. thick, and were neatly engraved on each side with hieroglyphics in a language called the reformed Egyptian, not then known on the earth. From these plates Smith, sitting behind a blanket hung across the room to keep the sacred records from profane eyes, read off, with the aid of the stone spectacles, the "Book of Mormon," or Golden Bible as he sometimes called it, to Oliver Cowdery, who wrote it down as Smith read it. It was printed in 1830, in a volume of several hundred pages. Appended to it was a statement signed by Oliver Cowdery, David Whitmer, and Martin Harris, who had become professed believers in Smith's supernatural pretensions, and are called by the Mormons "the three witnesses." They said: "We declare with words of soberness that an angel of God came down from heaven, and he brought and laid before our eyes that we beheld and saw the plates and the engravings thereon." Several years afterward all three of these witnesses quarrelled with Smith, renounced Mormonism, and avowed the falsity of their testimony. Immediately on the appearance of the "Book of Mormon" many of Smith's neighbors testified that he had repeatedly made contradictory statements about the plates and the Golden Bible. The "Book of Mormon" is a collection of 16 distinct books professing to be written at different periods by successive prophets. Its style is a verbose imitation of that of the common English translation of the Bible, portions of which, to the number in all of 300 passages, are incorporated without acknowledgment, and are frequently cited by Mormons as specimens of the book. A multitude of names are introduced, some Hebrew and Biblical, others Greek and Latin, and the rest imitations of the former. The first book professes to be the work of Nephi, a Jew, the son of Lehi, who dwelt at Jerusalem in the days of King Zedekiah, about 600 B. C. In obedience to the command of the Lord, who appeared to him in a dream, he went into the wilderness of Arabia and dwelt there a long time with his

family. At length, still under divine instruction, Lehi and his family set out in search of a promised land, and after travelling "nearly eastward" for eight years, "through a wilderness," they reached the ocean. Here they built a ship, and, guided by a compass, sailed to America. The Book of Mormon itself gives no indication of the part of the continent on which they landed, but later Mormon interpretations or revelations declare it to have been the coast of Chili. Those who arrived in America were Lehi and his wife, his four sons, Laman, Lemuel, Sam, and Nephi, and their four wives, two "sons of Ishmael" and their two wives, and Zoram, a servant, and his wife; in all, eight adult men with as many wives. Besides these, there were two infant sons of Lehi born during the journey through the wilderness, Jacob and Joseph. In America they found "beasts in the forest of every kind, both the cow, and the ox, and the ass, and the horse, and the goat." Soon after his arrival in America Lehi died, and dissensions speedily ensued between Nephi and his elder brothers Laman and Lemuel; and, separating from them, Nephi moved into the wilderness accompanied by Sam and Zoram and their families, the boys Jacob and Joseph, and such of the women and children as took his side. Laman and Lemuel and the "sons of Ishmael" and their families, as a punishment for rebelling against Nephi, whom the Lord had appointed to be their ruler, were cursed by the Lord, and they and all their posterity condemned to have dark skins and to "become an idle people, full of mischief and subtlety, which did seek in the wilderness for beasts of prey." This was the origin of the American Indians, who are consequently believed by the Mormons to be of Jewish race. Nephi died about 50 years after his arrival in America, and his people continued to be called Nephites and to be governed by kings bearing the name of Nephi for many generations. The record of their history was continued on golden plates by Jacob the brother of Nephi, Enos the son of Jacob, Jarom the son of Enos, Omni the son of Jarom, and finally by Mormon, whose name is given to a single book, as well as to the whole volume, and who, "many hundred years after the coming of Christ," transmitted to his son Moroni the plates containing the writings of the authors already mentioned, together with those of Mosiah, Zeniff, Alma, Helaman, Nephi the Second, and Nephi the Third. These books consist almost wholly of a narrative of transactions in North and South America, chiefly of wars between the Nephites and the Lamanites or red men, and of revolutions in the land of Zarahemla, which was near the isthmus of Darien, where there was an exceeding great city. At length, in the days of Nephi the Second, a terrible earthquake announced the crucifixion of Christ at Jerusalem, and three days afterward the Lord himself descended out of heaven into the chief

city of the Nephites, in sight of all the people, to whom he exhibited his wounded side and the prints of the nails in his hands and feet. He remained among them 40 days, instructing them in Christianity and instituting Christian churches. The Christians of America, unlike their brethren in the old world, immediately adopted the Christian era for their chronological computations; and according to the record, in the four following centuries the wars between them and the heathen Lamanites continued to rage, with great destruction of the Christians, whose populous and civilized cities, which were very numerous throughout North America, were gradually captured and destroyed. In the year 384 the Christians made their final stand on the hill Cumorah, in western New York, where in a great battle 230,000 of them were slain. Moroni, one of the survivors, after wandering a fugitive till A. D. 420, sealed up the golden plates on which all these things were written, and hid them in the hill where they were found by Joseph Smith. One of the books in the collection, the book of Ether, gives an account of an earlier settlement of America than that of Lehi, by a colony from the tower of Babel, soon after the deluge, which was led by Jared, and in time became a great nation, which was destroyed for its sins before the arrival of the colony from Jerusalem.—The religious teachings of the "Book of Mormon" relate in great part to doctrinal questions that were rife in the villages of western New York about 1830. Calvinism, Universalism, Methodism, Millenarianism, Roman Catholicism, and other modern forms of belief, are discussed. Infant baptism is warmly condemned, and polygamy is repeatedly denounced.—According to the opponents of Mormonism, from investigations made soon after the appearance of the "Book of Mormon," the fact is fully established that the real author of the work was Solomon Spalding, who was born in Ashford, Conn., in 1761, graduated at Dartmouth college in 1785, was ordained, and preached for three or four years. Relinquishing the ministry, he engaged in mercantile business at Cherry Valley, N. Y., whence in 1809 he removed to Conneaut, Ohio. In 1812 he removed to Pittsburgh, and thence in 1814 to Amity, Pa., where he died in 1816. He wrote several novels, which he was in the habit of reading to his friends in manuscript, as they were so worthless that he could find no publisher for them, while his poverty prevented him from issuing them at his own expense. During his residence in Ohio in 1810-'12 he wrote a romance to account for the peopling of America by deriving the Indians from the Hebrews, in accordance with a notion then prevalent in some parts of the country that the American Indians were descended from the lost tribes of Israel. As early as 1813 this work was announced in the newspapers as forthcoming, and as containing a translation of

the "Book of Mormon." Spalding entitled his book "Manuscript Found," and intended to publish with it by way of preface or advertisement a fictitious account of its discovery in a cave in Ohio. His widow published a statement in the "Boston Journal," May 18, 1839, declaring that in 1812 he placed his manuscript in a printing office at Pittsburgh, with which Sidney Rigdon was connected. Rigdon, she says, copied the manuscript; and his possession of a copy was known to all in the printing office, and was often mentioned by himself. Subsequently the original manuscript was returned to the author, who soon after died. His widow preserved it till after the publication of the "Book of Mormon," when she sent it to Conneaut, where a public meeting, composed in part of persons who remembered Spalding's work, had requested her to send the manuscript that it might be publicly compared with the "Book of Mormon." She says in conclusion: "I am sure that nothing would grieve my husband more, were he living, than the use which has been made of his work. The air of antiquity which was thrown about the composition doubtless suggested the idea of converting it to the purposes of delusion. Thus, a historical romance, with the addition of a few pious expressions, and extracts from the sacred Scriptures, has been constructed into a new Bible, and palmed off upon a company of poor deluded fanatics as divine." Sidney Rigdon was born in St. Clair township, Allegheny co., Pa., Feb. 19, 1793. Soon after getting possession of a copy of Spalding's manuscript, he quitted the printing office and became a preacher of doctrines peculiar to himself, and very similar to those afterward incorporated into the "Book of Mormon." He had a small body of converts to his notions when about 1829 he became associated with Joseph Smith, who was then endeavoring to gain believers to his tale of the golden plates and stone spectacles. It is asserted that through Rigdon's agency Smith became possessed of a copy of Spalding's manuscript, which he read from behind the blanket to his amanuensis Oliver Cowdery, with such additions as suited the views and purposes of Rigdon and himself. Immediately on its publication, the "Book of Mormon" was recognized not only by Spalding's widow but by many of his friends as his long lost work. The printing of the "Book of Mormon" was done at the expense of Martin Harris, who had some property, and was persuaded that he could make money by the speculation. While the work was in progress, this man called upon Prof. Anthon of New York with a transcript on paper which Smith had given him of the characters on one of the golden plates. "This paper," Prof. Anthon then says in a letter dated New York, Feb. 17, 1834, "was in fact a singular scroll. It consisted of all kinds of crooked characters, disposed in columns, and had evidently been prepared by some person who had before him at

the time a book containing various alphabets. Greek and Hebrew letters, crosses and flourishes, Roman letters, inverted or placed sideways, were arranged and placed in perpendicular columns; and the whole ended in a rude delineation of a circle, divided into various compartments, decked with various strange marks, and evidently copied after the Mexican calendar given by Humboldt, but copied in such a way as not to betray the source whence it was derived." This letter was written to contradict a report set afloat by Smith that Prof. Anthon had pronounced the characters to be Egyptian hieroglyphics.—Smith and Rigdon seem at first to have had vague and confused ideas as to the nature and design of the church they were about to establish. They were both inclined to teach millenarianism, which at that time was beginning to attract attention in western New York; and they accordingly settled into the doctrine that the millennium was close at hand, that the Indians were to be speedily converted, and that America was to be the final gathering place of the saints, who were to assemble at New Zion or New Jerusalem, somewhere in the interior of the continent. With the "Book of Mormon" as their text and authority, they began to preach this new gospel; and Smith's family and a few of his associates, together with some of Rigdon's previous followers, were soon numerous enough to constitute the Mormon church, as it was styled by the people around them, or the church of Latter Day Saints, as they presently began to call themselves. The church was first regularly organized at Manchester, N. Y., April 6, 1830, and the first conference was held at Fayette, N. Y., in June, at which time the number of believers had increased to 30. Smith, directed as he said by revelation, in January, 1831, led the whole body of believers to Kirtland, Ohio, which was to be the seat of the New Jerusalem. Here converts were rapidly made, and soon, desiring a wider field for the growth of the church, Smith and Rigdon travelled westward, looking for a suitable location, which was found in Independence, Jackson co., Mo., where in August Smith dedicated a site for the temple to be erected by the saints, and named the place New Jerusalem. On their return to Kirtland, where they proposed to remain for five years "and make money," Smith and Rigdon established a mill and a store, and set up a bank without a charter, of which Smith appointed himself president, and made Rigdon cashier. The neighboring country was flooded with notes of very doubtful value; and in consequence of this and other business transactions in which Smith and Rigdon were accused of fraudulent dealing, a mob on the night of March 22, 1832, dragged the two prophets from their beds, and tarred and feathered them. About a year afterward a government for the church was instituted, consisting of three presidents, Smith, Rigdon, and Frederick G. Williams, who together were

styled the first presidency, a revelation from the Lord having declared that the sins of Rigdon and Williams were forgiven, "and that they were henceforth to be accounted as equal with Joseph Smith, jr., in holding the keys of his last kingdom." About this time Brigham Young, a native of Vermont, a painter and glazier about 30 years of age, became a convert to Mormonism. (See YOUNG, BRIGHAM.) He arrived at Kirtland toward the close of 1832, and was soon ordained an elder, and began to preach. His talent and shrewdness speedily made him prominent, and in February, 1835, when a further step was taken in the organization of a hierarchy by the institution of the quorum of the twelve apostles, he was ordained one of the twelve, and sent out with the other apostles to preach the new doctrines. His field of labor was the eastern states, and he was signally successful in making converts. In 1836 a large and costly temple, which had been for three years in process of building, was consecrated at Kirtland; and in 1837 Orson Hyde and Heber C. Kimball, the latter of whom had become a convert in 1832, were sent as missionaries to England. In January, 1838, the bank at Kirtland having failed, Smith and Rigdon, to avoid arrest for fraud, fled in the night, hotly pursued by their creditors, and took refuge in Missouri. In that state, meanwhile, large numbers of Mormons had collected, and had become involved in quarrels with the people, by whom they were charged with plundering and burning habitations, and with secret assassinations; and after various conflicts with mobs, who drove them successively from Jackson co. and from Clay co., they settled in Caldwell co., at the town of Far West, where Smith and Rigdon joined them. The conflicts with the Missourians still continued, and many outrages were committed and several persons killed on both sides. In the midst of their external troubles, internal dissensions broke out among the Mormons. Several of their leading men apostatized and accused Smith of gross crimes and frauds. On Oct. 24, 1838, Thomas B. March, president of the 12 apostles, and Orson Hyde, also one of the apostles, made before a justice of the peace in Ray co., Mo., an affidavit in which March said, corroborated by Hyde: "They have among them a company, consisting of all that are considered true Mormons, called the Danites, who have taken an oath to support the heads of the church in all things that they say or do, whether right or wrong. . . . The plan of said Smith, the prophet, is to take this state; and he professes to his people to intend taking the United States, and ultimately the whole world. This is the belief of the church, and my own opinion of the prophet's plan and intentions. The prophet inculcates the notion, and it is believed by every true Mormon, that Smith's prophecies are superior to the law of the land. I have heard the prophet say that he would yet tread down his enemies and walk over their dead

bodies; that if he was not let alone he would be a second Mahomet to this generation, and that he would make it one gore of blood from the Rocky mountains to the Atlantic ocean." The defiant and menacing tone of the Mormon leaders contributed much to the excitement against them. Rigdon, in a sermon preached at Far West, July 4, 1838, said: "We take God and all the holy angels to witness this day, that we warn all men in the name of Jesus Christ to come on us no more for ever. The man, or the set of men, who attempts it, does it at the expense of their lives. And that mob that comes on us to disturb us, it shall be between them and us a war of extermination, for we will follow them till the last drop of their blood is spilled, or else they will have to exterminate us. For we will carry the seat of war to their own houses, and their own families, and one party or the other shall be utterly destroyed." Toward the close of 1838 the conflict between the Mormons and the Missourians assumed the character and proportions of civil war. The Mormons armed themselves, and, assembling in large bodies, fortified their towns and defied the officers of the law. The militia of the state was called out by the governor, and Rigdon and Smith were arrested, charged with treason, murder, and felony. The forces of the state being overwhelming in number, the Mormons capitulated and agreed to quit Missouri, and to the number of several thousands crossed the Mississippi into Illinois. They were soon after joined by Smith, who broke out of the jail where he had been confined awaiting trial. Rigdon had previously been liberated by a writ of habeas corpus. The Mormons were kindly received in Illinois, and Dr. Isaac Galland, who owned a large tract of land at Commerce, in Hancock co., gave Smith a considerable portion of it in order to enhance the value of the rest by the settlement of the Mormons there. Smith accordingly received a revelation commanding the saints to establish themselves at Commerce, and build a city to be called Nauvoo on the land presented to him, which he divided into house lots and sold to his followers at high prices. By this transaction, and by other equally successful speculations, the prophet in a few years amassed a considerable fortune. Nauvoo soon grew to be a city of several thousand inhabitants, the saints being summoned by a new revelation to assemble there from all quarters of the world, and to build a temple for the Lord, and a hotel in which Smith and his family should "have place from generation to generation, for ever and ever." The legislature of Illinois granted a charter for the city of Nauvoo, conferring upon it extraordinary privileges, which enabled Smith, Rigdon, and the other leaders to exercise almost unlimited civil power. They were authorized by charter to organize a military body, which was accordingly formed under the name of the Nauvoo legion, and comprised nearly all the Mormons capable of

bearing arms. Smith was commander of this force with the rank of lieutenant general. Besides this office, he held those of mayor of the city and first president of the church. By a revelation given April 6, 1830, he had been appointed "seer, translator, prophet, apostle of Jesus Christ, and elder of the church;" and the Lord had said to him: "The church shall give heed to all his words and commandments which he shall give unto you; for his word shall ye receive as if from my own mouth, in all patience and faith." The civil and military offices which he conferred upon himself at Nauvoo and the legion at his command gave him supreme power within the city, whose charter had been purposely so framed that the state authorities were almost excluded from jurisdiction within its limits. On April 6, 1841, the foundation of the temple was laid at Nauvoo, by Lieut. Gen. Smith, who appeared at the head of the legion, surrounded by a numerous military staff; and the saints being commanded by revelation not only to contribute to its erection, but to labor personally upon the work every tenth day, its walls rapidly arose.—In 1838 Smith had persuaded several women to cohabit with him, calling them his spiritual wives, although he had a lawful wife to whom he had been married in 1827. His wife became jealous of these rivals, and to pacify her Smith received, July 12, 1843, a revelation authorizing polygamy. This fact being whispered at Nauvoo, much scandal was created in consequence. The imputation was strenuously denied in public, and in 1845 the heads of the church deemed it prudent to put forth a formal denial in the following words: "Inasmuch as this church of Christ has been reproached with the crimes of fornication and polygamy, we declare that we believe that one man should have but one wife, and one woman but one husband; except in case of death, when either is at liberty to marry again." It was not till 1852 that they admitted the truth, and boldly avowed and defended polygamy on the authority of the revelation of 1843. Meantime Smith in 1843 and 1844 made advances to so many women in Nauvoo, soliciting them to become his spiritual wives, that great uproar was created by the declarations of those whose virtue was proof against his attempts. Among others who repelled and denounced him publicly was Mrs. Foster, wife of Dr. Foster. Her husband, together with William Law and others who had been similarly outraged, renounced Mormonism, and commenced at Nauvoo the publication of a newspaper, the "Expositor," to expose Smith. In the first number they printed the affidavits of 16 women to the effect that Joseph Smith, Sidney Rigdon, and others had endeavored to convert them to the spiritual wife doctrine, and to seduce them under the plea of having had special commission from heaven. This publication created great excitement, and on May 6, 1844, Smith and a party

of his followers attacked the "Expositor" office and razed it to the ground, destroying the presses and other contents of the building. Foster and Law took refuge in Carthage, the county seat, where they obtained warrants against Joseph Smith, his brother Hyrum Smith, and 16 others. The warrant was served upon Smith, but he refused to obey, and the constable who served it was driven from Nauvoo. The county authorities called out the militia to enforce the law; the Mormons armed themselves, and a civil war seemed impending, when the governor of the state persuaded the two Smiths to surrender and take their trial. They were committed to the jail at Carthage, and a guard stationed for their protection. On the evening of June 27 a mob attacked the jail, overpowered the guard, and fired upon the prisoners with rifles through a window and door. Hyrum Smith was instantly shot dead. Joseph returned the fire with a revolver till his charges were exhausted, and then attempted to escape through the window, but was shot as he leaped through it and fell to the ground dead. The death of the prophet caused much temporary confusion among the saints. Sidney Rigdon aspired to succeed him as head of the church; but Brigham Young was chosen first president, and Rigdon, being contumacious, was cut off from the communion of the faithful, cursed, and solemnly delivered to the devil "to be buffeted in the flesh for a thousand years." In 1845 the charter of Nauvoo was repealed by the legislature of Illinois, and the Mormons made preparations to remove to the Rocky mountains. Early in the following year they gathered in considerable numbers at Council Bluffs, Iowa. Those who remained in Nauvoo became again involved in trouble with the surrounding people, and in September, 1846, the city was cannonaded for three days, and its inhabitants were driven out at the point of the bayonet. In the following year pioneers crossed the plains from Council Bluffs to Salt Lake valley, Utah, where Brigham Young arrived July 24, 1847. In May, 1848, the main body of the saints set out for Utah, and arrived at the Great Salt lake in the autumn. Salt Lake City was founded (see SALT LAKE CITY), and large tracts of land were brought under cultivation. An "emigration fund" was established, and large numbers of converts were brought by a well organized system from Europe, chiefly from the working classes of Great Britain, and especially from Wales. A considerable number came also from Sweden and Norway, and a smaller number from Germany, Switzerland, and France. In March, 1849, a convention was held at Salt Lake City and a state organized under the name of Deseret, understood by the Mormons to signify "the land of the honey bee." A legislature was elected and a constitution framed and sent to Washington; but congress refused to recognize the new state, and in September, 1850, organized the country occupied by the Mor-

mons into the territory of Utah, of which Brigham Young was appointed governor by President Fillmore. In the following year the federal judges were forced by threats of violence from Brigham Young to quit Utah, and the laws of the United States were openly defied and subverted. This led to the removal of Brigham Young, and the appointment of Col. Steptoe of the United States army as governor. Col. Steptoe arrived in Utah in August, 1854, with a battalion of soldiers; but such was the state of affairs in the territory that he did not deem it prudent to assume the office of governor, and after wintering in Salt Lake City he formally resigned his post and removed with his troops to California. In a sermon preached in the tabernacle at Salt Lake City on the Sunday after Col. Steptoe's departure, Brigham Young said: "I am and will be governor, and no power can hinder it, until the Lord Almighty says: 'Brigham, you need not be governor any longer.'" Most of the civil officers who were commissioned about the same time with Col. Steptoe arrived in Utah a few months after he had departed. They were harassed and terrified like their predecessors. In February, 1856, a mob of armed Mormons, instigated by sermons from the heads of the church, broke into the court room of the United States district judge, and at the point of the bowie knife compelled Judge Drummond to adjourn his court *sine die*. Soon afterward all the United States officers, with the exception of the Indian agent, were forced to flee from the territory. These and similar outrages at length determined President Buchanan to supersede Brigham Young in the office of governor, and to send to Utah a military force to protect the federal officers and to compel obedience to the laws. The Mormons attempted to justify their treatment of the United States officials, by alleging that some of them were profligate and disreputable persons; an accusation which they attempted to sustain by scandalous statements which were probably not entirely destitute of truth. In 1857 the office of governor of Utah was conferred upon Alfred Cumming, a superintendent of Indian affairs on the upper Missouri, and that of chief justice on Judge Eckels of Indiana; and a force of 2,500 men under experienced officers was sent to protect them in the discharge of their functions. The Mormons were greatly excited at the approach of these troops. Young in his capacity of governor issued a proclamation denouncing the army as a mob, and forbidding it to enter the territory, and calling the people of Utah to arms to repel its advance. The army reached Utah in September, and on Oct. 5 and 6 a party of mounted Mormons destroyed several of the supply trains, and a few days later cut off 800 oxen from the rear of the army and drove them to Salt Lake City. The army, of which Col. A. S. Johnston had by this time assumed the command, was overtaken by the snows of winter

before it could reach Salt Lake valley, and about the middle of November went into winter quarters on Black's Fork near Fort Bridger. On Nov. 27 Gov. Cumming issued a proclamation declaring the territory to be in a state of rebellion. In the spring of 1858, by the intervention of Mr. Thomas L. Kane of Pennsylvania, who had gone to Utah by way of California, bearing letters from President Buchanan, a good understanding was brought about between Gov. Cumming and the Mormon leaders; and toward the end of May two commissioners, Gov. Powell of Kentucky and Major McCulloch of Texas, arrived at the camp with a proclamation from the president, offering pardon to all Mormons who would submit themselves to federal authority. This offer was accepted by the heads of the church, and shortly afterward the troops entered Salt Lake valley, and were stationed at Camp Floyd on the western side of Lake Utah, about 40 m. from Salt Lake City, where they remained till May, 1860, when they were withdrawn from the territory. (See *УТАН*.)—The priesthood of the Mormon church is organized into the following quorums: the first presidency, the twelve apostles, the high council, the seventies, high priests, elders, priests, teachers, and deacons. The first presidency (in 1875) consists of Brigham Young, George A. Smith, and Daniel H. Wells. They preside over and direct the affairs of the whole church. The twelve apostles constitute a travelling presiding high council. The whole hierarchy is divided into two bodies, the Melchizedek priesthood and the Aaronic priesthood. To the former, which is the highest, belong the offices of apostle, seventy, patriarch, high priest, and elder. The Aaronic priesthood includes the offices of bishop, priest, teacher, and deacon, and can be held only by "literal descendants of Aaron," who are designated as such by revelation. The Mormon church teaches that there are many gods, and that eminent saints become gods in heaven, and rise one above another in power and glory to infinity. Joseph Smith is now the god of this generation. His superior god is Jesus, whose superior god and father is Adam. Above Adam is Jehovah, and above Jehovah is Elohim. All of these gods have many wives, and they all rule over their own descendants, who are constantly increasing in number and dominion. The glory of a saint when he becomes a god depends in some degree on the number of his wives and children, and therefore polygamy is inculcated and wives are "sealed" to saints here on earth to augment their power in the heavens. The gods are in the form of men, and they are the fathers of the souls of men in this world. The ten commandments are considered the rule of life, together with a revelation given to Joseph Smith, Feb. 27, 1833, which is called "A Word of Wisdom." It teaches that it is not good to drink wine or strong drinks, excepting in the sacrament of the Lord's supper, and then it

should be home-made grape wine; that it is not good to drink hot drinks, or chew or smoke tobacco; that strong drinks are for the washing of the body, and that tobacco is an herb for bruises and sick cattle; that herbs and fruits are for the food of man; that grain is for the food of man and beasts and fowls; and that flesh is not to be eaten by man excepting in times of winter, cold, and famine. This "Word of Wisdom," however, is not regarded precisely as a commandment, but as a revelation to show forth the will of God, and "suited to the condition of all saints, young and old, male and female, without distinction." Infant baptism is condemned, but the children of the saints are considered old enough at eight years to be baptized. Baptism for the dead is practised, a living person being publicly baptized as the representative of one or more deceased persons. Washington, Franklin, and other famous men have thus been vicariously baptized into the church. There have been many dispensations of religious truth, beginning with Adam and ending with the greatest of all, that through Joseph Smith, which is to culminate in the building of the New Jerusalem in Jackson county, Mo., and the gathering together of all the saints on the continent of America. A portion of the Mormons reject polygamy, and do not approve of the political schemes of Brigham Young and the leaders of the church in Utah. Joseph Smith, the son of the prophet, is regarded by them as the true living head of the church, and under his direction they have established themselves at Nauvoo. Their number is inconsiderable. Another branch of the church has recently established itself at Independence, Mo., the supposed site of the "New Jerusalem." (For the political and social condition of the Mormons in Utah, see *УТАН*.)—See "The Mormons," by Charles Mackay (London, 1851); "The Mormons or Latter Day Saints in the Valley of the Great Salt Lake," by Lieut. J. W. Gunnison (Philadelphia, 1852); "The Book of Doctrines and Covenants selected from the Revelations of God by Joseph Smith" (Liverpool, 1854); "Utah and the Mormons," by Benjamin G. Ferris (New York, 1856); "A Compendium of the Faith and Doctrines of the Church of Jesus Christ of Latter Day Saints," by Franklin D. Richards, one of the twelve apostles (Liverpool, 1857); "Mormonism, its Leaders and Designs," by John Hyde, jr., formerly a Mormon elder (New York, 1857); and "The Rocky Mountain Saints," by T. B. H. Stenhouse (New York, 1873).

MORNAY, Philippe de, seigneur du Plessis-Marly, known as Duplessis-Mornay, a French soldier, born at Buhy, Isle de France, Nov. 5, 1549, died at Forêt-sur-Sèvre, Nov. 11, 1623. His father was a Roman Catholic, but his mother secretly brought him up as a Protestant, and after his father's death in 1560 he openly professed that religion. At an early age he travelled extensively, attached himself

to Admiral Coligni, and drew up a memorial in behalf of the Huguenots, which was presented to Charles IX. and Catharine de' Medici. After the massacre of St. Bartholomew's, from which he had a narrow escape, he took refuge in England. He returned in 1575, and Henry of Navarre intrusted to him some important missions to Queen Elizabeth. Being appointed general superintendent of Navarre, he stood almost alone the brunt of the religious civil war. On the alliance of his master with Henry III., he was placed in command of the town of Saumur, assigned as a place of safety to the Protestants. In 1589 he arrested and kept prisoner the old cardinal de Bourbon, whom the leaguers had proclaimed king in opposition to Henry IV. He opposed the abjuration of the latter, and evinced so intemperate a zeal for Calvinism as to incur the king's displeasure. Nevertheless he kept his governorship of Saumur, where on the death of Henry (1610) he proclaimed the authority of Maria de' Medici; but he quarrelled with that princess, and in 1620 was compelled to resign his office, receiving as indemnity a sum of 100,000 livres. His high character, virtue, and knowledge made him for nearly half a century the chief of the French Calvinists; and he was commonly styled by the Catholics *le pape des Huguenots*. He left various controversial works, and also his personal *Mémoires* (4 vols. 4to, 1624-'52; more complete edition by Auguis, 12 vols. 8vo, 1822-'5). See also *Mémoires de Madame de Mornay*, published by Mme. de Witt under the auspices of the French historical society (2 vols., Paris, 1868-'9).

MORNY, Charles Auguste Louis Joseph de, duke, a French statesman, reputed half brother of Napoleon III., born in Paris, Oct. 23, 1811, died there, March 10, 1865. He was regarded as the son of Queen Hortense and the count Auguste Charles Joseph de Flahaut. He assumed the name of the count de Morny, a French nobleman resident at the Isle de France (Mauritius), who is said to have received 800,000 francs for adopting him as a son. He was educated under the care of his supposed grandmother, Mme. de Flahaut, also known as Mme. de Souza from her second marriage with a Portuguese nobleman of that name, and placed in the institution Muron. His proficiency in study was remarkable, and he early attracted the attention of Talleyrand, who predicted that De Morny would one day be a minister. He attended one of the military schools of Paris during two years, and left it in 1832 with the rank of sub-lieutenant. He then served in Algeria, where he was wounded, and was decorated with the order of the legion of honor for saving the life of Gen. Trézel. Queen Hortense, on her death in 1837, bequeathed to him an annuity of 40,000 francs, and he soon became noted for his commercial and financial speculations. In 1838 he purchased near Clermont a manufactory for beet sugar, and largely engaged in that and other enterprises. From

1842 to 1848 he was a member of the chamber of deputies, and in 1849 he was elected to the legislative assembly. He was one of the most effective assistants of Louis Napoleon in the *coup d'état* of Dec. 2, 1851. After that event he held the office of minister of the interior until Jan. 23, 1852, when he relinquished it because Fould, Magne, and Rouher had withdrawn from the administration on account of the confiscation of the property of the Orleans family. Subsequently he became a member of the legislative body, and from 1854 to the time of his death was its president. He attended the coronation of the emperor Alexander II. as the representative of the French government, and was ambassador to Russia during the years 1856-'7. While at St. Petersburg he married, Feb. 19, 1857, a Russian lady of rank and wealth. In 1862 he was made duke. During the last years of his life he was actively engaged in railway, mining, and other commercial and industrial enterprises. Morny, under the pseudonyme Saint-Remy, was the author of several farces and operettas.

MORO, Attoni, also called Sir Anthony More, a Flemish painter, born in Utrecht about 1520, died in Antwerp about 1580. He gained considerable reputation as a portrait painter, and in 1552 he executed likenesses of the Spanish crown prince, the future Philip II., and of various members of the royal family of Portugal. In 1554 he painted the portrait of Philip's second wife, Mary of England, during whose reign he was court painter. Several of his portraits of the queen and of the English nobility are in the palace of Hampton court. Subsequently he was in the service of Philip II. and the duke of Alva, by the latter of whom he was appointed to the lucrative office of receiver general of the revenues of West Flanders.

MOROCCO, or **Marocco** (Arab. *Maghreb el-Aksa*, "the extreme west," or *El-Maghreb*, "the west"), a sultanate in N. W. Africa, between lat. 27° and 36° N. and lon. 4° 30' E. and 11° 50' W., bounded N. by the Mediterranean, E. by Algeria, S. by the desert of Sahara, and W. by the Atlantic; area, about 260,000 sq. m. Its frontier on the desert is generally considered to be on a line drawn directly E. from Cape Nun; its frontier on the province of Oran, Algeria, was determined by treaty of March 18, 1845. The coast line on the Mediterranean, about 250 m. long, runs N. W. from Algeria to Cape Tres Forcas (Ras ed-Deir), thence W. S. W. to about lon. 4° 30' W., where it again turns N. W. to Punta de Africa, its most northerly point; thence the course of the coast line is W. S. W. through the strait of Gibraltar to Cape Spartel on the Atlantic, where it turns abruptly and pursues a general S. W. course of about 750 m. to Cape Nun. On the Mediterranean coast Spain holds several fortified convict stations: Ceuta on Punta de Africa, Peñon de Velez, Alhucemas, Melilla, and the Jafarin islands. There are several small harbors belonging to Morocco, of

which the best, that of Tetuan, at the mouth of the little river Martil, is unfit for large vessels. On the Atlantic coast, besides Tangier in the strait of Gibraltar, the principal harbors are: El-Araish (Larash), Rabat, Casablanca (Dar el-Baida), Mazagan (Jedyda), Saffi (Asfy), and Mogadore. Mazagan has a bay protected by the land against all dangerous winds, and is the only harbor on the coast possessing natural advantages which might make it a good port of the second class. The Portuguese founded an establishment here in 1506, but abandoned it in 1769. The country back of Mogadore is composed of hills of moving sand, and the place would have no existence but for the will of the sovereign. It was founded in 1760 by Sidi Mohammed, who closed Agadir, the port of Sus, once the best and most important in the empire, from fear that the inhabitants, enriched by foreign commerce, would assert their independence. There are a few smaller and unimportant ports at the mouths of rivers.—The interior is divided into two great slopes by the Atlas mountains, which traverse it from N. E. to S. W. The chain is composed of several parallel ranges, connected with each other, and several separate lesser chains, preserving generally the same parallelism, divide the country between the main range and the Atlantic into fertile valleys and plains. On the Mediterranean coast a maritime range, called Er-Rif, from 2,500 to 3,500 ft. high, extends from Nemours in Algeria to the strait of Gibraltar; and there are also several chains running to the coast at right angles to the main range. Of the inferior chains on the southeast but little is known. The main range of the Atlas contains some of the most elevated peaks in N. Africa, many of which are covered with snow the greater part of the year. Miltzin, a peak about 30 m. S. E. of Morocco, is 11,500 ft. high. From all these mountains flow numerous streams, to which the natives give the general name of *wed* or *wad*. None of them are navigable, and many disappear in summer in the sands of the desert. Most of them change their names several times during their course. The principal rivers of the N. W. slope are the Lucos, Sebu, Burekrag, Umm er-Rebiah, and the Tensift, all of which empty into the Atlantic; those of the S. E. slope are the Muluia, which falls into the Mediterranean, the Ghir, which is lost in the desert, and the Draa, Nun, and Sus, which empty into the Atlantic. All the rivers are rapid, and in spring and summer the larger ones cannot be forded with safety.—Little is known of the geology of Morocco, but gneiss is supposed to be the principal formation in the Atlas. Marbles of different kinds are found, one of which is as white as Carrara marble. It is probable that the celebrated Numidian marbles of the Roman writers came from the Atlas. Gold in quartz veins is also found in these mountains, and galena rich in silver in the metamorphic rock in different parts of the country. Copper, iron, tin, nickel, cobalt, and

antimony are abundant in Sus. At the foot of Jebel Hadyd, 15 or 16 m. N. E. of Mogadore, are numerous traces of ancient iron mines, which are supposed to have been worked by the Carthaginians. The ore found there is fine and rich. Sulphur, rock salt, and nitre are found in various places; and there are numerous mineral springs, of which the hydro-sulphurous springs of Mulai Yakub near Fez are said to cure cutaneous affections and scrofula.—On the great slope N. W. of the Atlas range the climate is temperate and delightful. A refreshing sea breeze prevails during the greater part of the year, and the hot winds from the desert are intercepted by the mountains. On the plain of the city of Morocco it is hot in summer, but the thermometer seldom rises above 95°, and in winter it seldom falls below 40°. The mean annual temperature is about 64°. Snow never falls there, but the winds from the glaciers of the Atlas occasionally make the nights very cold. At Mogadore the extreme fluctuation of the thermometer does not exceed 35°; the annual rainfall averages 21 inches. The year is divided into a wet and a dry season; during the former, from November to March, showers are frequent; but during the other part of the year rain seldom falls. Toward the south there is less rain; and on the S. E. side of the mountains our knowledge of the climate is very imperfect, but extremes of heat and cold are supposed to prevail, and rain to be entirely wanting.—The Atlas mountains are clothed with luxuriant forests, in which are found the live oak, the cork oak, and the oak with edible acorns; the Aleppo pine, cedar of Lebanon, spruce, locust, and juniper; the *thuja*, which produces sandarach, the *euphorbia*, and other valuable gum trees; and in Sus flourishes the *argan*, the seeds of whose fruit produce a valuable oil, much used by the natives. The principal fruits are the date palm, olive, orange, grape, citron, banana, fig, almond, and pomegranate; but all the other fruits of southern Europe and northern Africa, and many of those of more tropical climes, grow in perfection. Among the wild plants of the southern provinces are the caper, the archil, the *dagmuz* or *tikiut* with a juice like honey, and the *fermun* or *talett*, which also furnishes a sweet milky juice. Agriculture is in a very primitive state, and but a very small part of the arable land is cultivated. The annual production is scarcely sufficient to supply the wants of the people, and when the harvests fail famine ensues. Yet Morocco might become, under an enlightened government, one of the most productive regions of the world. Wheat, barley, maize, millet (*durra*), and other cereals grow to perfection, but barley is the principal grain; cotton does well, and rice and sugar cane would succeed if properly cultivated; flax, hemp, and tobacco are raised to a limited extent; and beans, peas, lentils, sesamum, saffron, canary grass, and in some parts a few turnips, are cultivated in sufficient quantities to

supply the inhabitants. Indigo, cochineal, and silk could be raised with success, and some parts of the Atlas seem to be well adapted for coffee. —Of wild animals, the lion and the panther are found in the forests and valleys of the Atlas, and monkeys in the wooded mountains; in the level country the hyæna, jackal, and wild boar abound; and in the Sahara plains the ostrich, gazelle, and several other species of antelopes. Among the serpents are the *cerastes*, or horned viper, and a black snake called the *buska*, which is 6 or 7 ft. long and very venomous. Inoffensive serpents are numerous, and are domesticated in some places, particularly in Morocco, where they are scrupulously respected in the houses. Scorpions, lizards, and the chameleon abound, and the locust and a great variety of other insects of all colors, forms, and natures infest many parts of the country. Among the birds are the stork, flamingo, and many kinds of small game. The domestic animals are numerous, and the wealth of many of the tribes consists entirely in their flocks and herds. Horses, mules, asses, camels, cattle, sheep, and goats abound, but the pastoral art is in almost as primitive a state as agriculture. The small spirited Barbary horses are still raised, but the sultan's prerogative of taking the best for the use of his army wherever he can find them is a serious check on this industry. Their export, as well as that of horned cattle, is prohibited; but a few thousand of the latter are permitted to be shipped yearly for the use of the English garrison at Gibraltar. The sheep are much larger than the European varieties, and have broad tails loaded with fat, often weighing from 30 to 50 lbs. The wool is of fine quality and almost invariably white. The goats furnish the skins from which the celebrated morocco leather is made. Poultry abounds, and the rivers and waters of the coast are full of fish.—The inhabitants may be divided into five races, Berbers, Arabs, Moors, Jews, and negroes. The Berbers, who are the aborigines, occupy the Atlas and lesser mountain ranges. They are a fine race physically, are distinguished for courage, resolution, and temperance, and make good warriors and hunters. They are more laborious and persevering than the Arabs, and follow agriculture rather than pastoral pursuits. They are the best masons in the country, and most of their houses are built of stone. The Arabs, who compose the greater part of the rural population in the plains and in the valleys near the coast, are in general the descendants of the Mohammedan invaders. They also are a fine race physically, but they are braggarts and fanatics, and jealous in disposition; are incapable of supporting prosperity, and are often embroiled with the government. They live in tents, and are mostly agricultural laborers and shepherds. The Moors are a hybrid race, the greater part of them being descendants of those who were driven from Spain. They inhabit the cities and towns, and are generally effeminate, intriguing, and

given to pleasure and idleness. In youth they are slender, but become very corpulent in later life. They are more polished in their manner than the Arabs, but less social. Many of them hold official positions, and a large part of the commerce is in their hands. The Jews chiefly inhabit the cities, although some are found among the Berbers, and a few even in the Sahara at Wad Nun and at Akka. They are more ignorant than their brethren in other countries, but are shrewd and enterprising, and many of them become rich, as they are the sole dealers in bullion. Most of them are engaged in commerce. The negroes are slaves or descendants of slaves imported from Soodan and other parts of central Africa. As there is no prejudice against color in Morocco, their descendants are of all shades of complexion, and most of the sherifs and principal officials are mulattoes. Many of them become free when converted to Islamism, and are then enrolled in the *bokhary* or body guard of the sultan. They are intelligent and docile, but more stubborn and more malicious than the Moors and Arabs. In general the people of Morocco are barbarous and fierce, but not ferocious or bloodthirsty as they have sometimes been represented. The vendetta is customary among them, but they do not assassinate strangers and travellers. Theft is seldom accompanied by murder, except in case of prolonged resistance. Craig, a late English traveller, says the rarity of crime is remarkable. The total population has been estimated from 3,000,000 to 15,000,000. Reaumur, who visited Morocco in 1866, thinks the latter number the more probable; but according to Craig, the population, which at the beginning of the century, by a valuation considerably exaggerated, was estimated at 14,000,000, does not now exceed 4,000,000. The depopulation is still going on, and in the seaport towns alone has there been any development in the past few years. —The chief languages spoken are the Berber and the Arabic. In the south a modified form of the Berber is called Shellooh. The Arabic is but a gross dialect of the language of the Koran, and the pronunciation differs in the different provinces. The Jews speak an almost unintelligible Arabic jargon, and those of Tetuan, Tangier, and El-Araish an idiom of Spanish that is almost as bad. The negroes speak the Arabic with a pronunciation peculiar to themselves; many of them preserve also their native Mandingo and Bambara tongues. The dominant religion is Mohammedanism of the Sunnite division and Malekite sect. The Berbers know generally only the profession of faith of the Koran, and follow blindly the teachings of the marabouts who govern them. The negroes make sincere converts to Islamism, but are much addicted to the practice of magic. The Jews belong to the Sephardic (peninsular or western, improperly called Portuguese) division of their race, and follow the Talmud as interpreted by their rabbis to the

letter. Christianity is now tolerated. Education is at a low ebb. In Fez only are there any remains of the ancient universities. Young men destined to letters, law, or the service of religion are instructed there in grammar and Arab poetry, and in Mussulman law and theology. Elsewhere youth are taught little more than to recite passages of the Koran. The once famous libraries of Fez and Morocco have disappeared, and the empirical use of a few simples and the practice of immoderate bleeding and cauterization with fire are all that remains of the medicine of Avenzoar and Averrhoes. Printing is unknown, and the architectural skill once characteristic of the race is now but a tradition.—Manufacturing industry is almost as degenerate. The most remarkable products are the beautiful and delicate tissues of wool and silk, woven by hand at Fez; the embroideries on velvet and leather; the famous morocco leather, now almost entirely superseded in Europe by the products of the Marseilles tanneries; the carpets and rugs of Rabat and Salé; arms, and silver and gold work. Most of the cities contain tanneries where morocco of different colors is produced, the red and the yellow being of particular excellence. The dyers use cochineal, *rakout*, and pomegranate skins. The French introduced fuchsine, and for a time it superseded other red dyes, but its use was finally prohibited. At Fez are made and exported large numbers of the red caps which bear the name of that city. Their fine color is produced by a dye made from a berry found in the vicinity. Fez and Tetuan also manufacture bricks, which are sent to all the cities of Morocco, but not in large numbers, for they are used only in the houses of the rich. The best arms are made in Morocco and Tetuan. Jewelry and work in silver and copper are mostly in the hands of the Jews.—The maritime commerce is wholly carried on by foreigners. No vestiges remain of the famous Barbary corsairs that once scoured the Mediterranean, and Morocco now has no ship capable of making sail, and no sailor able to manage one. In 1871, 1,307 ships, of the total tonnage of 201,367, entered the eight free ports of Morocco. The entries at the several ports were as follows: Tetuan 214, Tangier 461, El-Araish 65, Rabat 24, Casablanca 168, Mazagan 224, Saffy 56, and Mogadore 95. Of these, 617 were English, 172 French, 362 Spanish, 142 Portuguese, and 14 of other nations. The total value of the exports for 1871 was \$3,906,000; imports, \$4,566,000. The principal exports are goat skins, wool, grain, olive oil, gum, wax, and almonds; the principal imports are Manchester goods, silver bullion, hardware, tea, and sugar. The inland traffic is inconsiderable, as there are no roads except in the vicinity of the towns, and few of the rivers have bridges; but there is a large trade with central Africa and with the East by caravans. The southern trade is carried on through Taflet, and the caravans, which number sometimes

from 15,000 to 20,000 camels, go as far as Timbuctoo, where they meet the merchants from further south and exchange products. The principal articles exported by this route are woollen cloths and *haïks* (mantles), Turkish daggers, looking glasses, salt, and tobacco; which are bartered for ivory, gold dust, ostrich feathers, gums, *malaghetta* or Guinea pepper, asafœtida, incense, and slaves. The trade with the East is carried on by one large caravan yearly, which assembles at Fez about seven months before the great festival at Mecca, and occupies the intervening time in dealing with the countries through which it passes. This caravan, which is much larger than those going south, carries skins and fine leather, woollen cloths and carpets, cochineal, indigo, and ostrich feathers; and brings back Persian silks and India goods, Egyptian cotton and raw silk, spices, perfumes, &c.—The sultanate of Morocco consists nominally of the former kingdoms of Fez and Morocco, of Sus, of the oasis of Taflet, and of several tribes S. E. of the Atlas; but while the sultan, in his spiritual character of emir of the believers, is venerated by all the Mohammedans of the west, his temporal authority extends practically only over the cities and the plains. About two thirds of the whole country, including the Atlas, a large part of Sus, and, with the exception of Taflet, all the S. slope of the Atlas from Wad-Ghir to the ocean, ought to be considered as politically independent. The sultanate is divided into 28 provinces, in each of which are from 2 to 15 small tribes, which are subdivided in the plains into *dwards*, or movable collections of tents, and in the mountains into *tchurs*, or hamlets and villages in which the dwellings are permanently attached to the soil. Each province has its marabouts, sheikhs, and notables, who united form a council. In the semi-independent provinces this is called *ait arbaïn*, and it affects to govern according to the precepts of the Koran. In those belonging properly to the sultan each province has one or several *kaid*s or governors, who administer the government as they please, on condition of keeping communication safe, paying the imposts, furnishing their contingent of men and horses for the army, and sending to the sultan at each great festival as large a present of money as possible. The *kaid*s are assisted by sheikhs chosen by themselves, who act directly upon the chiefs of *dwards* and *tchurs*. The cities are governed by a *kaid*, who is amenable to the sultan. Under him are a *cadi* or minister of public worship and of justice; a *mohatseb* or chief of police; a *nadher* or keeper of the property of the mosques; and the *omena* or administrators of the customs and the property of the state. All the cities are enclosed by walls, and the gates are shut at night. The streets have no names, and the houses no numbers, but the division into quarters is distinct, and the inhabitants of each are held responsible as a body for the maintenance of order.

The chief interior cities, in the order of importance, are as follows: Fez, Morocco, Mequinez, Azimur, Tarudant, Theza, Ujda, Alcazar el-Kebir, Wezzan, Sofron, Dunnet, and Tafilet or Tafilet. The capitals are Fez and Morocco, in each of which the sultan resides for two or three years at a time. Mequinez is inhabited chiefly by the families of the body guard. Wezzan is the grand centre of the brotherhood of the Mulai Thaieb, and is peopled only by the descendants of the founder of this order in Algeria and Morocco. Tarudant is the capital of Sus. The army proper consists of about 30,000 cavalry, composed of the body guard and the military tribes of Fez, the Sherarda, Sherarga, Ondaya, and a part of the Gherwan, who follow from father to son the military profession (*mekhazni*). The greater part of these troops always accompany the sultan; the rest are detached in companies according to need. Permanent garrisons, varying from 1,000 to 300 in number, are stationed only at Fez, Marve, Rabat, Ujda, and in the Rif. In the other towns there are generally from 20 to 50 soldiers at the disposition of the authorities. The military enjoy great privileges and live at their ease. They are armed with sabres and long flint-lock guns, and wear no other distinctive uniform than the Fez cap, which is worn by all state officials. The late sultan Sidi Mohammed tried to form an infantry corps, but the discipline was not compatible with the character and habits of the people, and the 3,500 or 4,000 men whom he raised were mostly renegades and foreigners. The government has mints at Fez, Morocco, and Rabat, but they do little more than convert French crowns into the money of the country.—The Mauritania of the ancients comprised Morocco and a part of Algiers. (See MAURITANIA.) When the Arabs completed their conquest of northern Africa (698–709) the Moors adopted their religion and customs. No general government was organized till about 787, when Edris ibn Abdallah, a descendant of Mohammed, founded the kingdom of Fez. His son and successor, Edris ibn Edris, founded the city of Fez about 807. In the 11th century the warlike sect of the Al-Murabathin or Almoravides arose among the independent tribes in the deserts of the south, and about 1058 their chief Abubekr ibn Omar was proclaimed emir of all Morocco. In 1070 he crossed the mountains, and in 1072 founded the city of Morocco. The dynasty of the Almoravides was succeeded by those of the Almohades, the Beni Merinas, and the El-Watasi. In 1561 the descendants of Sherif Hosen founded a new dynasty, which in the beginning of the 17th century had extended its sway over all Morocco and as far S. as Timbuctoo. In 1578 King Sebastian of Portugal invaded the country, but was defeated at Alcazar and probably killed. On the death of Hamed Sherif al-Mansour, his empire was divided among his five sons, which led to the estab-

lishment in 1648 of a new dynasty by Muley Sherif el-Fileli, king of Tafilet, which still continues on the throne. In 1787 the sultan made a treaty of peace and friendship with the United States, and in 1836 a second treaty of peace and commerce, to remain in force for 50 years. In 1814 the slavery of Christians was abolished, and in 1817 the sultan disarmed his marine and prohibited piracy. In 1844, during the reign of Abderrahman (1823–59), the Moors took up arms to aid Abd-el-Kader against the French, and the prince de Joinville bombarded Tangier and took possession of Mogadore, which was given up on the conclusion of peace. The French also bombarded Sale in 1851, in retaliation for the plunder of a ship on the coast. In 1859 the French made an incursion from Algeria into Morocco in revenge for depredations on their frontiers, and in the same year Spain declared war in retaliation for attacks on her commerce by the Rif pirates. On Feb. 6, 1860, Tetuan surrendered after a well contested battle (Feb. 4), and in April a treaty of peace was signed, which guaranteed to Spain 400,000,000 reals for the expenses of the war. In the same year a Moroccan ambassador was sent to London, the first since the time of Charles II., and in 1861 the British government gave a guarantee for a loan of £426,000 to the sultan to meet his engagements with Spain. In March, April, and May, 1870, a French detachment from Algeria under Gen. Wimpffen made a tour of exploration through S. E. Morocco, and reported favorably on the climate, water, &c. In September, 1871, an insurrection of Berbers broke out in Morocco, and the Spanish fortifications at Melilla were attacked; but the guns of the besiegers were dismounted by the fire from the citadel. The sultan Sidi Mohammed, who succeeded his father Abderrahman in 1859, died Sept. 20, 1873, and his son Muley Hassan was proclaimed Sept. 25.

MOROCCO (Arab. *Marakesh*), a city and one of the capitals of the sultanate of Morocco, on the N. side of a plain 1,500 ft. above the sea, 4 m. S. of the river Tensift, and about 250 m. S. W. of Fez; lat. 31° 38' N., lon. 7° 36' W.; pop. about 50,000. The walls, which are 7 m. in circuit, are built of *tappia* (earth, pebbles, and lime pounded together), and are about 23 ft. high. One part is flanked with towers at regular intervals, but most of them are in ruins, and the walls are so dilapidated that pedestrians easily find a passage in after the gates are closed. There are seven gates, besides two leading into the *kasbah* or citadel. A large part of the enclosed space is covered with gardens. The streets are wide at the gates, but in the centre of the city they form a network of filthy lanes, almost impassable for pedestrians in rainy weather. The houses are generally of one story, built of *tappia* whitewashed, with flat roofs and terraces, and opening on an inner court. They have no windows or doors to the street, the entrance usually opening on a lane

connecting with the main street. The houses of the better classes have a second story of brick. There is no public promenade except the great square of the Jama el-Fna, where jugglers and mountebanks perform by day, and which is the rendezvous at night of the vagabonds of the city. A market for the sale of horned cattle is held in it every Friday. There are other markets and several bazaars for particular classes of goods. The iron merchants, blacksmiths, carpenters, and butchers have each their special street, which is shut at night, and in which no one is allowed to reside. Wholesale dealers have their offices in the caravansaries. The palace of the sultan, in the *kasbah* in the S. part of the city, consists of two grand courts, in the midst of gardens, around which are the royal residence and the chambers of the ministers and secretaries. N. of the palace

and attached to it is the treasury, said to contain immense wealth. There are many mosques, some of which are very large, but none of any architectural pretensions. One having a tower 250 ft. high, surmounted by a lantern, is said to have been built by the architect of the Giralda at Seville. There are three prisons, one for Jews, one for general criminals, and one for prisoners of state. In the N. part of the city is the Zawia or sanctuary of Sidi ibn Abbas, a charitable institution, where the poor receive alms and an asylum for the night. It is also an inviolable refuge for criminals. Like most of the mosques, it is very rich, the houses and gardens belonging to it being valued at more than \$1,000,000. Without the walls are several aqueducts, mostly ruinous, but which still bring water from the mountains into the reservoirs, and supply 20 public baths. The



Morocco.

inhabitants of Morocco are a mixture of Moors, Algerines, Tunisians, Egyptians, Arabs from the Sahara, negroes, and Jews. The latter, who number about 6,000, have a quarter of their own, called El-Melah. They seldom go into the city proper, and when they do both men and women are obliged to take off their shoes. A large part of the business is in their hands, and they are the gold, silver, copper, and tin smiths of the city. Morocco is an agricultural rather than an industrial centre. The sole manufacture in which it excels is that of leather, particularly of red and yellow morocco. All products of the country, excepting the cereals, pay an octroi duty both going in and going out of the gates. There is also a tax of $2\frac{1}{2}$ per cent. on all sales, paid by the buyer, and the government has a monopoly of tobacco.—Morocco was founded in 1072 by Abubekr ben

Omar, of the dynasty of the Almoravides. It was captured and nearly destroyed in 1146 by Abdelmumen, king of the Almohades, who rebuilt and restored it in 1147-'8. Schools and colleges were founded by his successors, and in the 13th century it was a famous seat of learning, and the Moors of Spain, Algeria, and Tunis sent their children to be educated in its universities. At the height of its prosperity it is said to have had a population of more than 500,000. Its decadence began with the expulsion of the Moors from Spain.

MORPHEUS (Gr. *μορφειν*, to shape), in Grecian mythology, the son of Sleep and god of dreams. He is represented in a reclining posture, with a crown of poppies. His name (the fashioner or moulder) was derived from his function of shaping and controlling dreams.

MORPHIA. See **OPIMUM**.

MORPHY, Paul Charles, an American lawyer, celebrated as a chess player, born in New Orleans, La., June 22, 1837. He early exhibited a fondness for the game of chess, and at the age of 12 had encountered successfully the best amateurs of his native city. He entered St. Joseph's college in 1850, and during his college course exhibited his remarkable skill in various contests with Löwenthal and others. At the chess congress in New York in 1857, he defeated in a majority of games, many being at considerable odds, the first players of the United States. In 1858 he first exhibited his ability to play without seeing the board, sometimes conducting seven games at once. In the summer of that year he played 14 games with Löwenthal in London, in which Morphy won 9, Löwenthal 3, and 2 were drawn. On Aug. 26 Mr. Morphy attended the annual meeting of the British chess association at Birmingham, where he played eight games simultaneously without seeing the boards, winning six games and losing one, and one being drawn. In September he went to Paris, where he first played a match of seven games with Mr. Harwitz, winning five and drawing one; and after defeating the best French players at the *café de la régence*, including Rivière, Laroche, Jourmond, and Devineck, he encountered on Dec. 20 the celebrated Adolph Anderssen, considered the champion of German chess. The result of the match was: Morphy 7, Anderssen 2, drawn 2. Mr. Morphy continued in Paris playing with his usual success till April 4, 1859, when he returned to London, and during the remainder of his stay exhibited his power in matches and in blindfold play as before. On his return to the United States he was admitted to the bar, and since then has resided and practised his profession in New Orleans, with short intervals of residence in Richmond and Mobile.

MORRIS. I. A N. county of New Jersey, bounded N. E. by the Pequonnock river, E. and S. E. by the Passaic, and drained by Rockaway and Whippany rivers and the head branches of the Raritan; area, 650 sq. m.; pop. in 1870, 43,137. It is traversed by ranges of hills, some of which, as Schooley's and West Trowbridge mountains, reach a considerable elevation. It abounds in copper, iron, zinc, marble, limestone, sandstone, and manganese; there are 27 iron mines, which give employment to a great number of the inhabitants. It is intersected by the Morris canal and the Morris and Essex railroad, the latter passing through the capital. The chief productions in 1870 were 80,897 bushels of wheat, 23,776 of rye, 608,024 of Indian corn, 290,721 of oats, 49,764 of buckwheat, 168,611 of potatoes, 18,361 lbs. of wool, 535,274 of butter, and 34,859 tons of hay. There were 5,170 horses, 8,595 milch cows, 5,883 other cattle, 8,770 sheep, and 7,046 swine; 4 manufactories of brick, 13 of carriages and wagons, 1 of cotton goods, 13 of iron in various forms, 3 of machinery, 4 of paper, 1 of roofing materials, 5 of sash, doors,

and blinds, 4 of woollen goods, 5 tanneries, 4 distilleries, 24 flour mills, and 15 saw mills. Capital, Morristown. **II.** An E. central county of Kansas, watered by the Neosho river and other streams; area, 655 sq. m.; pop. in 1870, 2,225. It is traversed by the Missouri, Kansas, and Texas railroad. The soil in parts is fertile. The W. portion is level and destitute of timber. The chief productions in 1870 were 41,714 bushels of wheat, 89,815 of Indian corn, 15,341 of oats, 17,549 of potatoes, 30,590 lbs. of butter, and 4,991 tons of hay. There were 1,033 horses, 3,604 cattle, 682 sheep, and 642 swine. Capital, Council Grove.

MORRIS, a city and the capital of Grundy co., Illinois, on the Illinois and Michigan canal, and the Chicago, Rock Island, and Pacific railroad, 53 m. S. W. of Chicago; pop. in 1870, 3,138. It is the shipping point of the county, and has an important trade in grain. It is the seat of St. Angela's academy, an institution for the superior instruction of females, under the control of the Roman Catholics, which was established in 1857. In 1873-'4 it had 10 instructors and 190 students. The city has graded public schools, including a high school, two national banks, two weekly newspapers, and several churches.

MORRIS, Charles, an American naval officer, born in Connecticut in 1784, died in Washington, D. C., Jan. 27, 1856. He entered the navy in July, 1799, and served in the war with Tripoli, 1801-'5. In January, 1807, he was promoted to a lieutenancy, and in the war of 1812 served as first lieutenant of the frigate Constitution, distinguishing himself during the chase of that ship for three days and nights by a British squadron in July, 1812, and by his gallantry in the action between the Constitution and Guerriere on Aug. 19, in which he received a severe wound. He was made captain, and in 1814 appointed to the command of the Adams of 28 guns, in which he made an important cruise upon the coasts of the United States and Ireland, harassing British commerce. In August, 1814, Capt. Morris entered the Penobscot river, and running up to Hampden made preparations to heave out for repairs. While he was engaged in this, a strong British expedition entered the river to capture the ship. A militia force assembled for her protection gave way, and Capt. Morris destroyed her, directing his crew to break up into small parties and make their way for 200 m. across the thinly inhabited country to Portland. After the peace with England he continued in active employment, being off duty but about 2½ years in a professional career of 56. At the time of his death he was chief of the bureau of ordnance and hydrography.

MORRIS, George P., an American journalist, born in Philadelphia, Oct. 10, 1802, died in New York, July 6, 1864. At an early age he removed to New York, where he wrote for the "New York Gazette" and the "American," to the first of which he contributed

verses as early as his 15th year. In August, 1823, in conjunction with Samuel Woodworth, he established the "New York Mirror," in which N. P. Willis and Theodore Fay were afterward associated, and which was discontinued Dec. 31, 1842. In 1843 Morris and Willis commenced the publication of the "New Mirror," which extended to three volumes, and in 1844 of the "Evening Mirror," a daily paper. At the close of 1845 he established alone a weekly journal called the "National Press," the title of which was changed to that of the "Home Journal" in November, 1846, when Willis again joined him. He acquired his chief reputation as a song writer, and his "Woodman, spare that Tree," "We were Boys together," "Land-Ho!" "Long Time Ago," "The Origin of Yankee Doodle," "My Mother's Bible," "Whip-poor-Will," &c., became very popular. Various editions of his poems have been published. In 1837 he produced a drama entitled "Briercliff," which had a run of 40 nights, and in 1842 he wrote the libretto of an opera entitled "The Maid of Saxony." He also published a volume of prose sketches entitled "The Little Frenchman and his Water Lots" (1838). He was long a general of militia.

MORRIS, Gouverneur, an American statesman, born at Morrisania, Westchester co., N. Y., Jan. 31, 1752, died there, Nov. 6, 1816. He graduated at King's (now Columbia) college in 1768, and in 1771 was admitted to the bar. At the age of 18 he wrote a series of newspaper articles on finance, which attracted much attention. From 1775 to 1778 he was a delegate to the provincial congress of New York, in which he was a member of the committee for drafting a constitution for the state. He was a delegate to the continental congress in 1777, and passed the following winter at Valley Forge as one of a committee appointed to examine, with Washington, into the state of the army. In 1779 he published a pamphlet entitled "Observations on the American Revolution." In May, 1780, he was thrown from his carriage, and his leg was injured so as to require amputation. In July, 1781, he was chosen by Robert Morris as assistant superintendent of finance, which office he held for 3½ years. After the revolution he resumed the practice of law, and also engaged with Robert Morris in mercantile speculations. On the death of his mother in 1786, he purchased the patrimonial estate at Morrisania from his brother. In 1787 he published an address to the assembly of Pennsylvania against the abolition of the bank of North America. He was a delegate from Pennsylvania to the constitutional convention of 1787, and was one of the committee of five appointed to draft the constitution. Mr. Morris sailed for France on business in December, 1788, and while there kept a minute diary. In 1791 he was appointed by Washington secret agent to England, to settle unfulfilled terms of the old treaty; he remained in London till September, but effected

nothing. In 1792 he was appointed minister plenipotentiary to France, and served until October, 1794, when he was recalled at the request of the French government, and travelled in Europe until the autumn of 1798. In 1800 he was elected by the legislature of New York to fill a vacancy in the United States senate, and served in that body till 1803, acting with the federalists. He spent the latter years of his life in retirement. He was a fine orator, and delivered numerous public addresses. He was one of the earliest promoters of the project for constructing the Erie canal, was chairman of the canal commissioners from their first appointment in March, 1810, until near the end of his life, and in the summer of 1810 examined the route to Lake Erie. Morris's resemblance to Washington was so close that he stood as the model of his form to the sculptor Houdon. His life, with selections from his correspondence and papers, has been written by Jared Sparks (3 vols. 8vo, 1832).

MORRIS, Lewis, a signer of the Declaration of Independence, half brother of the preceding, born at Morrisania, Westchester co., N. Y., in 1726, died there, Jan. 22, 1798. He graduated at Yale college in 1746, and engaged in farming on a very extensive scale on his paternal estate at Morrisania. He took strong ground against the act of parliament compelling the inhabitants of the province of New York to furnish with supplies the foreign troops quartered upon them. He was elected to the congress of 1775, and was a member of the committee on munitions of war. After the close of the session he was sent west to detach the Indians from the British. In 1776 he resumed his seat in congress, and signed the Declaration of Independence, although his estate was at that time in the hands of the enemy. As a consequence his manor was laid waste, and his family expelled. He afterward served in the state legislature.

MORRIS, Robert, an American financier, and a signer of the Declaration of Independence, born in Lancashire, England, Jan. 20, 1734, died in Philadelphia, May 8, 1806. When 13 years old he came to America, was placed in the counting house of Charles Willing, a merchant in Philadelphia, and in 1754 entered into partnership with the son of his employer. The firm continued till 1793, and at the beginning of the revolution was the largest commercial house in Philadelphia. Mr. Morris opposed the stamp act, signed the non-importation agreement of 1765, and was elected a delegate to the congress of 1775, serving on the military and naval committees. On July 1, 1776, he voted against the Declaration of Independence, and on the 4th declined to vote at all, considering the time premature and inappropriate; but when it was adopted he signed it. He was reelected to congress July 20, and again in 1777. At this period he was largely employed in managing the fiscal affairs of the country; and on his personal responsibility he

frequently borrowed large sums for the use of the government. In 1780 Mr. Morris, in conjunction with other citizens of Philadelphia, established a bank, by means of which 3,000,000 rations of provisions and 300 hogsheds of rum were forwarded to the army. On Feb. 20, 1781, he was unanimously elected superintendent of finance, and by subsequent resolutions of congress was invested with almost the entire control of the financial affairs of the government. At this time the treasury was more than \$2,500,000 in debt, the army was destitute, and the credit of the country exhausted. He established the bank of North America, which was incorporated by congress Dec. 31, 1781, and went into operation Jan. 7, 1782, with a capital of \$400,000. Pennsylvania and several other states soon afterward passed laws to protect and facilitate its operations; and it proved very efficient in relieving the government of its embarrassments. In the beginning of 1781 he furnished the army with several thousand barrels of flour; and in the campaign of that year he supplied nearly everything required for the expedition against Cornwallis. For this purpose he issued his own notes to the amount of \$1,400,000, which were finally all paid. But, harassed by the claims of the public creditors, and indignant at the indisposition of the several states to fulfil their engagements, Mr. Morris resigned in January 1783, but consented to serve until May 1, and did not finally withdraw until November, 1784. On May 6, 1784, congress at his urgent request appointed three commissioners to superintend the treasury, and a committee to inspect the conduct of the department. He published a long and able account of his administration. Before he resigned he issued a public notice pledging himself personally to provide for his engagements in behalf of the government. No agent of marine being appointed, Mr. Morris, as superintendent of finance, was compelled to regulate the affairs of the navy until the close of 1784. He aided in obtaining the renewal of the charter of the bank of North America in 1786, which had been annulled by the Pennsylvania legislature in 1784. In 1787 he was a member of the convention which framed the federal constitution; and on Oct. 1, 1788, he was elected a member of the first United States senate. He declined the post of secretary of the treasury offered to him by Washington, and recommended Alexander Hamilton as a suitable incumbent. In partnership with Gouverneur Morris, in the spring of 1784, he sent to Canton the first American vessel that ever appeared in that port. In his old age he lost his fortune by land speculation, and during the latter years of his life was confined in prison for debt. Mr. Morris was an impressive public speaker and an able writer.

MORRIS, Thomas A., an American bishop, born in Kanawha co., Va., April 28, 1794, died in Springfield, O., Sept. 2, 1874. He was licensed as a preacher of the Methodist Episcopal

church in 1814, and joined the Ohio conference in 1816. He labored in the itinerant ministry in Ohio, Kentucky, and Tennessee till 1834, when he was elected first editor of the "Western Christian Advocate" at Cincinnati. In 1836 he was elected bishop. For several years previous to his death, through physical infirmity, he was debarred from active duty. He published "Sermons," and "Sketches of Western Methodism" (Cincinnati, 1852).

MORRIS, William, an English poet, born near London in 1834. He is the eldest son of a merchant who died in 1844, leaving a large estate. He was educated at Forest school in Walthamstow, at Marlborough, and at Exeter college, Oxford. He studied painting, but did not succeed in that profession. In 1858 he published a small volume entitled "The Defence of Guenevere, and other Poems." In 1863, with several partners, he set up in London an establishment for the artistic designing and manufacture of various articles, especially wall paper, stained glass, tiles, and household decorations. At this business Morris has ever since wrought as a designer, giving his evenings to the composition of poetry. He published "The Life and Death of Jason," a narrative poem, in 1867, and "The Earthly Paradise" (4 parts) in 1868-'71. The latter poem is made up of 24 legendary and romantic tales in verse, recited by a company of voyagers who had sailed westward from Norway to find the earthly paradise. He has also published a poem entitled "Love is Enough, or the Freeing of Pharamond" (1873), and, in connection with Eirikr Magnusson, "The Story of the Volsungs and the Niblungs," translated from the Eddas.

MORRIS DANCE, an old English dance, usually performed with castanets, tabors, staves, or swords, by young men lightly dressed, with bells fixed about their legs, and parti-colored ribbons streaming from their arms and shoulders. It is supposed to be derived from the Morisco or Moorish dance still popular in Spain under the title of the fandango. It can be traced as early as the reign of Henry VII., when it was one of the sports of May day, Holy Thursday, the Whitsun ales, weddings, and other festivals. In the May game it was often performed by persons representing Robin Hood, Little John, Friar Tuck, Maid Marian, the fool, Tom the piper, and the hobby-horse. The May festivities of Robin Hood were chiefly designed for the encouragement of archery, and it is not certain that either he or his companions were prominent in the dance. Maid Marian is supposed to represent his mistress, but the part was often filled by a boy dressed in a girl's habit, and called queen of the May. It was once usual for the queen to be splendidly attired, but after the degeneracy of the dance the character was personated by a clown, who obtained the name of Malkin. Friar Tuck maintained his place in the sport till the reign of Elizabeth. The fool bore a bauble in his hand, and a coxcomb hood with asses' ears on

his head. Tom the piper was a minstrel of the superior order, with a complicated red, blue, and yellow dress, a sword, a feather in his cap, and a tabor, tabor stick, and pipe to distinguish his profession. The hobby-horse was designed for antics and tricks of legerdemain. During the reign of Elizabeth the Puritans checked the May pastimes by their invectives against "the terrestrial furies" which indulged in them. Maid Marian and the hobby-horse were restored by King James's "Book of Sports," but were again degraded during the commonwealth. In some parts of England, however, the dance continued till very recently, and it existed in France in the 18th century.—The fullest account of the subject is by Douce, in a dissertation with his "Illustrations of Shakespeare."

MORRISON, a central county of Minnesota, intersected by the Mississippi river, and watered by several small streams; area, about 1,175 sq. m.; pop. in 1870, 1,681. The surface consists chiefly of rolling prairies; the soil is productive. The chief productions in 1870 were 11,927 bushels of wheat, 9,345 of Indian corn, 18,987 of oats, 13,668 of potatoes, and 20,005 lbs. of butter. The value of live stock was \$56,116. Capital, Little Falls.

MORRISON, Robert, an English missionary, born in Morpeth, Northumberland, Jan. 5, 1782, died in Canton, Aug. 1, 1884. He was apprenticed to his father as a last maker, but commenced the study of theology in 1801, and entered the Independent academy at Hoxton in 1803. In 1804 he offered his services to the London missionary society, and in 1805 removed to the mission college at Gosport, where he began the study of Chinese. In

the winter of 1807 he was ordained, and in the following autumn went to Canton, being the first Protestant missionary to China. In 1808 he was appointed translator to the East India company's factory at Canton, and began translating the Scriptures into Chinese. The New Testament appeared in 1814, and the Old Testament, executed with the assistance of Mr. Milne, in 1818. In November of the latter year Mr. Morrison caused the foundation of an Anglo-Chinese college at Malacca. In 1823-'6 he was in England, and became a member of the royal society. His Chinese grammar (4to, Serampore, 1815) and his Chinese dictionary (5 vols., Macao, 1815-'23) were his chief original works. His "Memoirs" were compiled by his widow (2 vols., London, 1839).

MORRISTOWN, a post village in Morris township, capital of Morris co., New Jersey, on the Whippany river and the Morris and Essex division of the Delaware, Lackawanna, and Western railroad, 43 m. N. N. E. of Trenton, and 32 m. by rail W. by N. of New York; pop. about 5,000. It is built on an elevated plain commanding beautiful views of the surrounding country. The streets are regularly laid out, the houses neatly built, and there is a public square in the centre, in which is a soldiers' monument. It is the principal market for the surrounding country, which is rich in agricultural products, and it contains a handsome court house, two national banks, manufactures of iron, &c., six hotels, five schools, three weekly newspapers, and eight churches. It is a favorite summer residence for citizens of New York. Morristown is noted as having been the headquarters of the



New Jersey State Asylum for the Insane.

American army on two occasions during the revolutionary war, in the winters of 1776-'7 and 1779-'80. The remains of an old fort are still visible in the rear of the court house. The house occupied by Gen. Washington is now the property of the state. About 3 m.

from the village a new state insane asylum, one of the largest and best arranged in the country, is in course of erection. It is to be completed early in 1875, and with site and equipments will cost about \$2,000,000. The grounds embrace 408 acres. The entire length

of the building is 1,243 ft., and the depth, from the front of the main centre to the rear of the extreme wing, 542 ft. The wings on the right and left of the centre building are three stories high, except those at the extreme ends, which are two stories. It is built principally of light granite quarried on the grounds, in ornamental style, and will accommodate about 1,000 patients.

MORROW, a central county of Ohio, drained by the head streams of Vernon and Olentangy or Whetstone rivers; area, 370 sq. m.; pop. in 1870, 18,583. The surface is undulating and the soil highly fertile. It is intersected by the Cleveland, Columbus, Cincinnati, and Indianapolis railroad. A large quarry of free-stone is worked near the capital. The chief productions in 1870 were 207,714 bushels of wheat, 615,679 of Indian corn, 343,300 of oats, 92,452 of potatoes, 20,589 of flax seed, 31,242 lbs. of flax, 67,077 of maple sugar, 532,348 of wool, 652,684 of butter, and 38,106 tons of hay. There were 7,985 horses, 16,040 cattle, 113,291 sheep, and 16,820 swine; 7 manufactories of carriages and wagons, 1 of dressed flax, 1 woollen factory, 3 flour mills, and 14 saw mills. Capital, Mount Gilead.

MORROW, Jeremiah, an American statesman, born in Gettysburg, Pa., Oct. 6, 1771, died in Warren co., Ohio, March 22, 1852. In 1795 he removed to the Northwest territory, and in 1802 was elected a delegate to the convention for forming the state constitution of Ohio. He was the first representative in congress from that state, serving from 1803 to 1813, and was United States senator from 1813 to 1819. From 1822 to 1826 he was governor, then canal commissioner, and from 1841 to 1843 was again a member of congress.

MORSE. See **WALRUS**.

MORSE, Edward S., an American naturalist, born in Portland, Me., June 18, 1838. He prepared himself for a mechanical engineer, and spent several years as a draughtsman in the Portland locomotive works, during which time he studied zoölogy. In 1859 he became connected with the museum of natural history at Cambridge under Agassiz, and in 1867 with the Boston society of natural history as curator of mollusca; and he was one of the first officers of the Peabody academy at Salem, where he has long resided. In 1868 he was made a fellow of the American academy of arts and sciences, and in 1871 received the degree of Ph. D. from Bowdoin college, where until 1873 he was professor of comparative anatomy and zoölogy. In 1872 he was elected lecturer on zoölogy at Harvard college. Prof. Morse has been very successful as a public lecturer on natural history. His principal papers have been on the "Terrestrial Pulmonifera of Maine," "A Classification of Mollusca, based on the Principle of Cephalization," "On the Land Slides in the Vicinity of Portland, Me.," "On the Tarsus and Carpus of Birds," "On the Systematic Position of the Brachiopoda,"

and "On the Embryology of Terebratulina," which have appeared in the publications of the Boston society of natural history, the Portland society of natural history, the Essex institute at Salem, and the New York lyceum of natural history. He has endeavored to show that the relations of the brachiopoda are with the chaetopod worms, and not with the mollusca, where they have heretofore been placed.

MORSE. I. Jedidiah, an American geographer, born in Woodstock, Conn., Aug. 23, 1761, died in New Haven, June 9, 1826. He graduated at Yale college in 1783, was licensed to preach in 1785, in 1786 was tutor in Yale college, and in 1789 was installed as pastor of the first Congrégational church in Charlestown, Mass. In 1794 he received the honorary degree of D. D. from the university of Edinburgh. He prepared in 1784, at New Haven, a small 18mo geography, which was the first work of the kind published in America. This was followed by larger geographies and gazetteers of the United States from materials obtained by travelling and correspondence. Jeremy Belknap, the historian of New Hampshire, Thomas Hutchins, geographer general of the United States, Ebenezer Hazard, and others, who had undertaken a similar task, contributed to his use the materials they had gathered; and for 30 years he remained without an important competitor in this department. Reprints of the early editions of his larger geographical works were published in Great Britain, and French and German translations in Paris and Hamburg. Much of Dr. Morse's life was spent in religious controversy, in maintaining the orthodox faith in the New England churches against Unitarianism. He engaged actively in 1804 in the enlargement of the Massachusetts general association of Congregational ministers; in 1805 he established the "Panoplist," a monthly religious periodical, of which he was sole editor for five years; he was prominent in founding the Andover theological seminary, and in effecting the union between the Hopkinsians and other Calvinists on their common symbol, the assembly's catechism, the articles of which union were signed in his own study in Charlestown, in the night of Nov. 30, 1807, by himself, Dr. Samuel Spring, and Dr. Eliphalet Pearson; and he participated in the organization of the Park street church in Boston in 1808. His persevering opposition to the so-called "liberal" views of religion brought on him a persecution which deeply affected his naturally delicate health; and in 1820 he resigned his pastoral charge. In that year he was commissioned by the government to visit the Indian tribes on our N. W. borders; and the record of his labors was published in 1822 under the title of "Indian Report," &c. Dr. Morse also published "A Compendious History of New England," in conjunction with Elijah Parish, D. D. (Cambridge, 1804; 3d ed. enlarged, 1820); "Annals of the American

Revolution" (Hartford, 1824); and 25 sermons and addresses on special occasions. His life has been written by the Rev. William B. Sprague, D. D. (New York, 1874). **II. Samuel Finley Breese**, an American artist and inventor, eldest son of the preceding, born in Charlestown, Mass., April 27, 1791, died in New York, April 2, 1872. He graduated at Yale college in 1810, and went to England with Washington Allston in 1811 to study painting under his tuition and that of Benjamin West. In 1813 he received the gold medal of the Adelphi society of arts for an original model of a "Dying Hercules," his first attempt at sculpture. He returned to the United States in 1815, practised his profession in Boston and in Charleston, S. C., and removed to New York in 1822. In 1824-'5, in connection with other artists, he organized a drawing association, which resulted in the establishment in 1826 of the "National Academy of Design." Morse was chosen its first president, and was continued in that office for 16 years. In 1829 he visited Europe a second time to complete his studies in art, residing for more than three years in the principal cities of the continent. During his absence abroad he was elected professor of the literature of the arts of design in the university of the city of New York; and in 1835 he delivered a course of lectures before that institution on the affinity of those arts. While in college Mr. Morse had paid special attention to chemistry and natural philosophy; and these sciences at length became a dominant pursuit with him. In 1826-'7 Prof. J. Freeman Dana had been a colleague lecturer in the city of New York with Mr. Morse at the Athenæum, the former lecturing upon electro-magnetism and the latter upon the fine arts. They were intimate friends, and in their conversations the subject of electro-magnetism was made familiar to the mind of Morse. The electro-magnet on Sturgeon's principle (the first ever shown in the United States) was exhibited and explained in Dana's lectures, and at a later date, by gift of Prof. Torrey, came into Morse's possession. Dana even then suggested by his spiral volute coil the electro-magnet of the present day; this was the magnet in use when Morse returned from Europe, and it is now used in every Morse telegraph throughout both hemispheres. He embarked in the autumn of 1832 at Havre on board the packet ship Sully; and in a casual conversation with some of the passengers on the then recent discovery in France of the means of obtaining the electric spark from the magnet, showing the identity or relation of electricity and magnetism, Morse's mind conceived not merely the idea of an electric telegraph, but of an electro-magnetic and chemical recording telegraph, substantially and essentially as it now exists. The testimony to the paternity of the idea in Morse's mind and to his acts and drawings on board the ship is ample. His own testimony is corroborated

by all the passengers (with a single exception) who testified with him before the courts, and was considered conclusive by the judges; and the year 1832 is therefore fixed as the date of Morse's conception, and realization also, so far as drawings could embody the conception, of the telegraph system which now bears his name. (See JACKSON, CHARLES THOMAS.) A part of the apparatus was constructed in New York before the close of 1832, but circumstances prevented its completion before 1835, when he put up a half mile of wire in coils around a room and exhibited a telegraph in operation. In September, 1837, he exhibited the operation of his system in the university of New York. From the greater publicity of this exhibition, the date of Morse's invention has erroneously been fixed in the autumn of 1837, whereas he operated successfully with the first single instrument in November, 1835. In 1837 he filed his caveat in the patent office in Washington, and asked congress for aid to build an experimental line from that city to Baltimore. The house committee on commerce gave a favorable report, but the session closed without action, and Morse went to Europe in hope of interesting foreign governments in his invention. The result was a refusal to grant him letters patent in England, and the obtaining of a useless *brevet d'invention* in France, and no exclusive privilege in any other country. He returned home to struggle again with scanty means for four years, during which he continued his appeals at Washington. His hope had expired on the last evening of the session of 1842-'3; but in the morning, March 4, he was startled with the announcement that the desired aid of congress had been obtained in the midnight hour of the expiring session, and \$30,000 placed at his disposal for his experimental essay between Washington and Baltimore. In 1844 the work was completed, and demonstrated to the world the practicability and the utility of the Morse system of electro-magnetic telegraphs. (See TELEGRAPH.) Violations of his patents and the assumption of his rights by rival companies involved him in a long series of lawsuits; but these were eventually decided in his favor, and he reaped the benefits to which his invention entitled him. It is doubtful if any American ever before received so many marks of distinction. In 1846 Yale college conferred on him the degree of LL. D.; and in 1848 he received the decoration of the *Nishan Iftikar* in diamonds from the sultan of Turkey. Gold medals of scientific merit were awarded him by the king of Prussia, the king of Wurtemberg, and the emperor of Austria. In 1856 he received from the emperor of the French the cross of chevalier of the legion of honor; in 1857 from the king of Denmark the cross of knight commander of the first class of the Danebrog; in 1858 from the queen of Spain the cross of knight commander of the order of Isabella the Catholic; from the king of Italy the cross of the order of SS. Maurice and Lazarus, and from

the king of Portugal the cross of the order of the tower and sword. In 1856 the telegraph companies of Great Britain gave him a banquet in London; and in Paris, in 1858, another banquet was given him by Americans, numbering more than 100, and representing almost every state in the Union. In the latter year, at the instance of Napoleon III., representatives of France, Russia, Sweden, Belgium, Holland, Austria, Sardinia, Tuscany, the Holy See, and Turkey met in Paris to decide upon a collective testimonial to him, and the result was a vote of 400,000 francs as a personal reward for his labors. On Dec. 29, 1868, the citizens of New York gave him a public dinner. In June, 1871, a bronze statue of him, erected by the voluntary contributions of telegraph employees, was formally unveiled in the Central park, New York, by William Cullen Bryant; and in the evening a reception was held in the academy of music, at which Prof. Morse telegraphed, by means of one of the instruments used on the original line between New York and Washington, a message of greeting to all the cities of the continent. The last public service which he performed was the unveiling of the statue of Franklin in Printing House square, New York, on Jan. 17, 1872. Submarine telegraphy also originated with Prof. Morse, who laid the first submarine lines in New York harbor in the autumn of 1842, and received at the time from the American institute a gold medal for that achievement. In a letter from Mr. Morse to the secretary of the United States treasury, dated Aug. 10, 1843, it is believed occurs the first suggestion of the project of the Atlantic telegraph. While in Paris in 1839 he made the acquaintance of Daguerre, and from drawings furnished him by the latter he constructed on his return the first daguerreotype apparatus and took the first sun pictures ever taken in America. He was the author of various scientific and literary papers. In 1829 he published a collection of the poems of Lucretia Maria Davidson, with a memoir; and in 1835 a volume entitled "Foreign Conspiracy against the Liberties of the United States." A series of papers of reminiscences of his early struggles in behalf of the telegraph appeared in 1868. His life has been written by the Rev. S. Irenæus Prime, D. D. (New York, 1875).

III. Sidney Edwards, an American journalist and geographer, brother of the preceding, born in Charlestown, Mass., Feb. 7, 1794, died in New York, Dec. 23, 1871. He graduated at Yale college in 1811. In 1812-'13 he wrote a series of articles for the Boston "Columbian Centinel," illustrating the danger to the American Union from an undue multiplication of new states in the south, and showing that it would give to a sectional minority the control of the government. In 1815, while studying at the law school in Litchfield, Conn., he was invited to establish a weekly newspaper in Boston, which resulted in the issue of the "Boston Recorder," the prototype of that class of jour-

nals now so widely known as "religious newspapers." He was the sole editor and proprietor during the 15 months in which he was connected with it. In 1817 Mr. Morse, in connection with his elder brother, invented and patented the flexible piston pump. In 1820 he published a 12mo school geography, and in 1822 an 8vo geography, which was used as a text book in several American colleges. In May, 1823, in connection with his younger brother Richard O. Morse, he established the "New York Observer," now the oldest weekly newspaper in that city, and the oldest religious newspaper in the state of New York. In 1834 he conceived the idea of a new mode of engraving, applicable especially to the production of plates for printing maps in connection with type under the common printing press; and after five years of experiment he succeeded in June, 1839, with the aid of his assistant, Henry A. Munson, in producing by the new art, which he named cerography, superior map prints. One of the first applications of cerography was to the illustration of a school geography written by the inventor, of which more than 100,000 copies were printed and disposed of during the first year. The art of cerography has never been patented, nor has the process been revealed to the public. Mr. Morse continued as senior editor and proprietor of the "Observer" till 1858, when he disposed of his interest to the Rev. Dr. S. I. Prime, his associate since 1840. The last years of his life were devoted to the invention of the bathometer for rapid exploration of the depths of the sea, and he was engaged in an essay on the subject at the time of his death.

MORTAR. See ARTILLERY, and CANNON.

MORTGAGE (Fr. *mort*, dead, and *gage*, pledge; Lat. *vadium mortuum*). Kent defines a mortgage to be "the conveyance of an estate by way of pledge for the security of a debt, to become void on payment of it." The old law writers Glanvil and Spelman say that mortgage is so called because, between the time of making the conveyance and the time appointed for payment of the debt, the creditor by the old law received the rents of the estate to his own use, so that these rents were dead or lost to the mortgageor. Littleton gives another derivation of the word, viz.: "If the feoffor doth not pay the sum due at the day limited, then the land which is put in pledge upon condition for the payment of the money is taken from him, and so dead to him upon condition." This derivation is the one usually adopted; though the former has been sometimes preferred, not only because the idea which it conveys of the mortgage, or *vadium mortuum*, is directly opposed to that of the *vadium vivum*, an old form of security no longer in use, in which the accruing rents were applied to diminish the debt, but also because it illustrates the intention which mortgages were first probably designed to effect. For in the times when the exaction of interest was esteemed

usurious and was prohibited by the law, this conditional alienation was devised, not at all with the design of depriving the mortgagee of his property if he failed to repay the money, but that the mortgagee might in the mean time receive the rents to his own use in lieu of what he would otherwise have received as interest.—A mortgage was generally created by a conveyance of lands from a debtor to his creditor, with a condition that if a sum of money were paid on a certain day the conveyance should be void, and the debtor might have his former estate. But a mortgage might also be made by an absolute deed of conveyance and a defeasance back to the grantor. This defeasance was a separate instrument defeating the principal deed by making it void if the condition was performed. The former mode was by far the more usual. The maxims of the common law were strictly applied to this kind of conveyance; and if the money were not paid at the very day specified in the deed, the lands were absolutely forfeited, nor would a subsequent tender of the money avail the debtor. But the mortgaged lands were plainly only intended as security for the payment of the money borrowed; and large estates were sometimes pledged for the payment of small debts. A strict forfeiture in such cases was not only inconsistent with the plain principles of justice, but was contrary to the spirit of the contract. For these reasons the court of chancery interposed, and by an equitable construction mitigated the severity of the common law, by holding the condition to be in the nature of a penalty, against which a just relief should be given. This just relief consisted in allowing the debtor, if within a reasonable time he paid the debt with interest, to call on his creditor for a reconveyance of the lands. But on the other hand, chancery gave to the mortgagee, after reasonable indulgence to the mortgagee, the right to call upon the latter for the payment of the debt, or in default thereof to be for ever foreclosed or excluded from any further right of redemption. The right of redemption is considered in equity to be an inseparable incident of every mortgage, and no executory agreement that it shall be forfeited, lost, or abridged on failure to perform the condition of the mortgage will be sanctioned. From mortgages, however, in respect to restrictions of the equity of redemption, must be distinguished sales with agreements to repurchase, or, as they are usually termed, conditional sales. In their forms the two transactions are often very similar, and it is difficult to distinguish them. The difference is, that one is only security for a debt, while the other is a regular purchase, for a price paid or to be paid, to become absolute on a particular event. Since this complete recognition of the equity of redemption by the courts, the mortgage has gradually ceased to be looked upon as a conveyance of an estate; and though it still is so in form, the mortgagee is regarded

as owner subject to a lien on the land for the amount of the mortgage debt, and he may sell or mortgage again subject to such lien; the land may be taken on execution against him; it is subject to dower and curtesy, and on his death passes to his heirs. On the other hand, the interest of the mortgagee is personalty, and may be sold as such, and the mortgage lien passes on a sale of the debt whether formally assigned or not. One important incident usually pertaining to ownership, however, still attaches to the mortgagee's right; namely, that he may demand and obtain possession even before his debt is due. This right, however, is taken away by statute in some of the United States. The lien of the mortgagee is terminated by payment, without any formal discharge, though an instrument to go upon the record of the mortgage as evidence of the fact is usually required and given. A tender of the amount due will also discharge the lien, even though not accepted.—The equity of redemption can only be cut off by some species of foreclosure. Possession of the mortgagee may ripen into foreclosure, if he occupies the land for a period after the debt is due equal to the time required at law to bar a right to lands under the statute of limitations, and in some states for a much shorter period after formal entry as provided. If the mortgage, as is usually the case, contains an authority to the mortgagee to sell the land to satisfy the debt, he may foreclose by the exercise of this power at public auction, without resort to suit. Statutes regulate the process, and usually require a previous published notice for several weeks or months. The most usual process of foreclosure is by suit in equity, or analogous proceedings, in which decree or judgment will be entered that unless payment be made by a short day named, the land shall be sold by the proper officer of the court for its satisfaction. Sometimes, though only under peculiar circumstances, a decree for strict foreclosure is made; that is, it is decreed that unless payment is made by the day fixed the equity of redemption shall be barred, and the title of the mortgagee be established. Usually the mortgage secures the personal obligation of the mortgagee, evidenced by bond, note, or other form of promise; but sometimes it is given without, the mortgagee simply conveying the land with a condition that the conveyance shall be void if a certain sum shall be paid at a time named. Such a mortgage leaves it to his option to pay or not, and the mortgagee's remedy is confined to the land if he fails to pay. But when a mortgage is given to secure a personal obligation, the mortgagee will pursue his remedy by suit on such obligation or by foreclosure, as he may prefer; and if he elects the latter process and fails to realize sufficient to satisfy the debt, he may then resort to the personal responsibility of the mortgagee for the deficiency. It should be added that mortgages may be conditioned for the performance of any other legal

promise besides the payment of money; but the rules above given are equally applicable to all cases.—Something may here be said of equitable liens in the nature of mortgages. In England, where the borrower of money deposits with the lender the title deeds of an estate, he is regarded as charging the estate in equity with a lien for the security of the loan, and this is called an equitable mortgage, because the courts of equity take notice of and enforce it, though it is not recognized at law. This principle is unknown in the law of the United States. But the similar lien of the vendor of lands for unpaid purchase money is recognized both here and in England. (See LIEN.)—Many of the rules applicable to mortgages of real property are involved also in those of personal property, but the difference in the subjects introduces some differences into the law. Any personal property, and any profits arising out of personal chattels, may be the subjects of mortgage. But the articles must be such that they are capable of being specifically designated and identified by written description. The mortgagee has the legal title subject to be defeated by redemption, and, unless otherwise agreed, the right to the immediate possession. As between the parties, the mortgage is valid without a change of possession; but as to subsequent purchasers and creditors, the continued possession by the mortgagee is *prima facie* but not conclusive evidence of fraud; the burden of proof rests on the mortgagee to explain the transaction, and it is for the jury to decide upon the facts. The mortgage must be generally recorded upon a public register; but a full actual notice, such a notice, says the court in Massachusetts, as would have been given by the instrument of mortgage, may preclude a subsequent purchaser or creditor from availing himself of the omission of registration. Under the usual statutory provisions the mortgage must be recorded in the town where the mortgagee lives. In these mortgages the property passes so completely to the creditor that, unlike the equity of redemption in mortgages of real property, it cannot be seized on execution or attached as the property of a mortgagee. This rule is modified by statute in some of the states. As to assignment and extinguishment of the mortgage by payment, the same general principles apply as to mortgages of real property. The same remark may be made of the distinction between mortgages and conditional sales. The legal doctrine respecting the mortgagee's interest being strictly maintained, a failure to pay the debt at the time appointed vests in him an absolute title, unless where the statutes of the state in which the transaction took place provide an equity of redemption. In other cases, however, this right may be given by courts having equitable powers.

MORTIER, Édouard Adolphe Casimir Joseph, duke of Treviso, a French soldier, born at Cateau-Cambrésis, Feb. 13, 1768, died in Paris, July

28, 1835. He served as captain under Dumouriez in 1791, was made adjutant general for his bravery at Hondschoote in 1793, and became brigadier after the battle of Altenkirchen, June 4, 1796. In this capacity he served in 1799 on the Danube, and in Switzerland under Masséna. After the 18th Brumaire Bonaparte made him commander of the 15th and 16th military districts, sent him to Hanover, which he conquered in 1803, put him at the head of the artillery of the consular guard, and in 1804 made him marshal of the empire. He led a division in the campaign against Austria in 1805; subdued Hesse-Cassel and Hamburg in 1806; worsted the Swedes in several encounters, and occupied Pomerania with the exception of Stralsund. In 1807 he assisted in the campaign against Prussia, fought at Friedland, and received the title of duke of Treviso. As commander of the 5th corps of the army in Spain, he participated in the siege of Saragossa, won a victory at Ocaña, Nov. 19, 1809, laid siege to Cadiz, and defeated the Spaniards on the Gévoira in 1811. In the expedition against Russia in 1812, he commanded the junior imperial guard. He figured in nearly all the battles fought in 1813; and on March 30, 1814, with Marmont, he took part in the defence of Paris. Having adhered to the Bourbons, he was named peer of France during the first restoration, but joined Napoleon on his return from Elba. On the second restoration, his refusal to sit among the judges of Marshal Ney lost him his peerage. In 1816 he was elected to the chamber of deputies, and in 1819 was restored to his seat in the upper chamber, where he voted with the liberal party. Under Louis Philippe he was ambassador to Russia in 1831, and prime minister in 1834, with the portfolio of the war department. He was killed by Fieschi's "infernal machine," while on horseback by the side of Louis Philippe.

MORTIFICATION. See GANGRENE.

MORTIMER, Roger, baron of Wigmore, earl of March, the favorite of Isabella, queen consort of Edward II. of England, executed at Smithfield, Nov. 29, 1330. He was convicted of treason in the reign of Edward II. and pardoned, but afterward took part in the rebellion of the earl of Lancaster, and was made prisoner at Boroughbridge in 1322. His life was again spared, and having escaped from the tower, he went to France and entered the service of Charles of Valois. At Paris in 1325 he met Queen Isabella, who had been sent thither by Edward to negotiate a treaty. The queen entered into guilty relations with him, and, having secured the person of her young son, planned with Mortimer and the other leaders of the barons to secure possession of the kingdom. Mortimer went with her to England in 1326. The king was deposed, and his son Edward III. was proclaimed in his stead, and for some years Isabella and her paramour governed the realm in the name of the young prince. A council of regency had been

appointed, but Mortimer superseded them all. He procured the death of the dethroned monarch in his prison, and obtained the title of earl of March and valuable confiscated estates. But the scandal of his life was denounced from the pulpit; the nobles wearied of his arrogance, and Edward finally resolved to take the sceptre into his own hands. While the queen and Mortimer in 1330 were lodged in Nottingham castle during the session of parliament in that town, the king and Lord Montacute with attendants entered by night and carried off the earl. The king summoned a new parliament to meet him at Westminster, and by it on Nov. 26 Mortimer was condemned as a traitor.

MORTMAIN (Fr. *mort*, dead, and *main*, hand; Lat. *mortua manus*). Under the system of feudal tenures, the lords of estates enjoyed certain privileges on the death or change of their vassals. When the tenant died, leaving only an infant heir, the lord resumed the fee and retained it during the heir's minority, in order to maintain out of its rents and profits a person capable of rendering the services due for the lands. This was the lord's wardship. Marriage, in the sense of the feudal law, consisted in his right to exact a price for consenting to the marriage of his ward. Relief was another incident of feudal tenure; it was a fine or composition paid by the heir for the privilege of succeeding to the estate, which had reverted in the lord on the death of his immediate grantor. These and similar profits accrued to the lords on the death of their feudatories. It is the distinctive quality of a corporation that it never dies, and lands held by such bodies produced none of these feudal fruits; but, in the language of Sir Edward Coke, "the lands were said to come to dead hands as to the lords." The mischief existed even before the conquest. Within two centuries after it, says Blackstone, the busy acquisition of landed estates by the ecclesiastical corporations had diminished perceptibly the feudal services ordained for the defence of the realm; the circulation of property from man to man began to stagnate, and the lords were curtailed of their wardships, reliefs, escheats, and the like fruits of their seigniories. The evil attracted the attention of the legislature, and it began to impose restraints on the capacity of corporations aggregate to acquire lands. The earliest of the laws made with this intent is contained in Magna Charta. The 36th chapter of that instrument declares that "it shall not be lawful for any one to give his lands to any religious house, and to take the same land again to hold of the same house, &c., upon pain that the gift shall be void and the land shall accrue to the lord of the fee." This act destroyed the power to take by gift; for this mode had been adopted by the ecclesiastics to evade the necessity of asking the king's license, which they must by the existing laws have done if they took the lands by purchase. The religious houses next attempted to accomplish their object by buying lands that were *bona*

vide holden of themselves, as lords of the fee, or by taking long leases of the desired estates. This is the origin of those terms for 1,000 years or more, sometimes met with in conveyances. This evasion of forfeiture produced the statute *de religiosis* (7 Edward I.), which provides that "no persons, religious or other whatsoever, shall buy or sell any lands or tenements, or under the color of any gift or lease or any other title whatsoever receive the same, or by any other craft shall appropriate lands in any wise to come into mortmain, upon pain of forfeiture, at the election of the lords of the fee." But their shrewd lawyers contrived still to relieve the clergy from the embarrassments of these acts. They observed that the statutes thus far extended only to gifts and conveyances between the parties. They invented what afterward became one of the most approved assurances in the English conveyancing, namely, a recovery; that is, feigning title to the land which was intended to be conveyed, they brought an action to recover it. By collusion with the tenant no defence was made, and it was the necessary legal consequence that the land was adjudged to the demandants. This contrivance was defeated by the statute of Westminster the second, 13 Edward I. Incapacitated now to take either by gift, purchase, lease, or recovery, and despairing of holding any legal estate in lands, the ecclesiastics resorted to the distinction, familiar to the Roman law, between the right to the rents and profits of land and the right of property in the land itself. They therefore procured a conveyance to a third person and his heirs, with the understanding that the religious houses and their successors should have the beneficial enjoyment of the estate. This usufructuary interest, as distinguished from the legal ownership, was denominated the use, and founded the whole doctrine of uses and trusts in the present law. Once more the legislature interposed, and by the statute 15 Richard II. declared that no conveyance of lands or other possessions should be made to the use or profit of any spiritual persons, without the license of the king and the mesne lords, upon pain of forfeiture. Though these statutes of mortmain were generally directed against the ecclesiastical corporations, civil corporations were equally capable of the mischiefs which they contemplated; indeed, they are within the letter of the acts 7 Edward I. and 15 Richard II. The effect of these statutes was to make all lands conveyed in mortmain forfeitable, if the lords or the king elected. But a waiver of this right of forfeiture was always a sufficient license to corporations to hold lands. In process of time, as the mesne seigniories declined, and the rights of intermediate lords could be hardly traced, the license of the king as lord paramount was esteemed sufficient. It was therefore provided by the statute 7 and 8 William III., c. 97, that for the future the crown might, in its discretion, grant

a license to take or alien in mortmain, of whomsoever the estates might be holden. The act 9 George II. is now the leading English statute of mortmain. It forbids the gift of money or lands to charitable uses, except by deed operating immediately, and without power of revocation, formally executed and enrolled in chancery at least six months before the donor's death. In favor of churches, colleges, and hospitals, some modifications of the statute have been admitted.—In the United States the English mortmain laws have not in general been adopted or recognized, except in Pennsylvania; and in that state, by an act passed in 1855, bequests, devises, or conveyances for religious or charitable uses may be valid if made by deed or will at least one calendar month before the death of the testator or alienor. In New York, by a statute enacted in 1848, gifts to charitable corporations by will must be made two months before the testator's death; and by another enacted in 1860 any person having a husband, wife, child, or parent is precluded from bequeathing more than one half his clear estate to any society, association, or corporation. In Georgia in like manner a gift to charitable uses by will is made void, if the testator has a wife or issue living, unless made 90 days before his death. In other states the checks to the acquisition of real estate by corporate bodies are such as are imposed by their charters, or by the general laws under which they have become incorporated.

MORTON, a central county of Dakota, bounded E. by the Missouri river, recently formed, and not included in the census of 1870; area, about 1,100 sq. m. It is intersected by the Heart and Cannon Ball rivers. The Northern Pacific railroad is to pass through it. The surface consists chiefly of undulating prairies.

MORTON, James Douglas, earl of, regent of Scotland, born in Dalkeith in 1530, executed in Edinburgh, June 3, 1581. He was a younger son of the great family of Angus, but in 1553 succeeded to the estates and title of his father-in-law, the third earl of Morton. In 1561 he became privy councillor, and in the beginning of 1563 was appointed lord high chancellor. He participated in the murder of Rizzio, and fled to England, but was pardoned. Although cognizant of the plot to destroy Darnley, he seems to have had no hand in its execution. After the forced abdication of Mary which followed the death of Darnley, and the coronation of her infant son, Morton was reinstated in his office of lord chancellor. He supported the interests of the earl of Murray, the regent, against those of the queen; and to him is especially due the result of the battle of Langside, in consequence of which Mary determined to fly to England. In the violent contentions which divided Scotland after the assassination of Murray, Morton became the real head of the Protestant party, and was a leader of that portion of the people who espoused the king's cause as opposed to the queen's. The earl of

Mar, who had succeeded the earl of Lennox as regent, having died in October, 1572, Morton was elected regent in his stead on Nov. 24. Thenceforth he ruled Scotland with great rigor, thereby rendering himself odious. He resigned Sept. 12, 1577, but soon regained his authority. Through the agency of the new favorite of the king, Capt. Stewart, he was brought to trial for participation in the murder of Darnley, found guilty of high treason, and decapitated by an instrument called the maiden, which he is said to have introduced into Scotland.

MORTON, John, one of the signers of the Declaration of Independence, born in Ridley, Chester (now Delaware) co., Pa., in 1724, died in April, 1777. He was for many years a surveyor. In 1756 and for many sessions subsequently he was a member of the general assembly of Pennsylvania, serving for several sessions as speaker. He was a member of the stamp act congress, which met in New York in 1765. From 1766 to 1770 he was high sheriff of his county, and afterward became judge of the court of common pleas, and a judge of the supreme court of Pennsylvania. In 1774-'6 he was a member of the continental congress, and gave the casting vote of Pennsylvania in favor of the Declaration of Independence. He was chairman of the committee of the whole on the adoption of the system of confederation.

MORTON, Nathaniel, secretary of Plymouth colony, Mass., born in England in 1612, died in Plymouth, June 29, 1685. He came to America with his father in July, 1623, and in 1645 was appointed secretary of the colony, which office he held until his death. He was the author of "New England's Memorial, or a Brief Relation of the most Memorable and Remarkable Passages of the Providence of God manifested to the Planters of New England," &c., compiled chiefly from the manuscripts of his uncle William Bradford and the journals of Edward Winslow, and including the period from 1620 to 1646 (4to, Cambridge, 1669; 2d ed., 12mo, Boston, 1721; 3d ed., Newport, 1772; 5th ed., with notes by Judge Davis, 1826; 6th ed., with notes by the Congregational board, 1855). In 1680 he wrote a brief ecclesiastical history of the Plymouth church in its records.

MORTON, Samuel George, an American physician, born in Philadelphia, Jan. 26, 1799, died there, May 15, 1851. He studied medicine, and graduated at the university of Pennsylvania in 1820. In the same year he entered the university of Edinburgh, where he graduated in 1823. In 1824 he settled in Philadelphia as a physician. He was recording secretary of the Philadelphia academy of natural sciences in 1825, and president in 1840. In 1834 he went to the West Indies, where he studied the diversity of races and the relations resulting from their contact. In September, 1839, he was elected professor of anatomy in the Pennsylvania medical college, which post he resigned in 1843. His collection of skulls, which was the largest museum of comparative

craniology in existence, contained about 1,500 specimens, nearly 900 of which were human, obtained from widely separated regions of the earth. It now belongs to the Philadelphia academy of natural sciences. The result of his investigations, as bearing specially on the American aborigines or Indians, is embodied in "Crania Americana, or a Comparative View of the Skulls of various Aboriginal Nations of North and South America; to which is prefixed an Essay on the Varieties of the Human Species," with 78 plates and a map (folio, Philadelphia and London, 1839). His "Crania Egyptiaca, or Observations on Egyptian Ethnography, derived from History and the Monuments," with numerous plates and illustrations (4to, 1844), was based principally on a collection of 98 heads obtained by G. R. Gliddon from the tombs and catacombs of Egypt. He also published "Observations on the Ethnology and Archæology of the American Aborigines" (Silliman's "Journal," vol. ii., 2d series, 1846); an "Essay on Hybridity in Plants and Animals, considered in reference to the question of the Unity of the Human Species" (*ib.*, vol. iii., 1847); and "An illustrated System of Human Anatomy, Special, General, and Microscopic" (1849).

MORTON, William Thomas Green, an American dentist, born in Charlton, Mass., Aug. 9, 1819, died in New York, July 15, 1868. In 1840 he began the study of dentistry in Baltimore, and 18 months afterward settled in Boston. Among improvements introduced by him was a new kind of solder by which false teeth are fastened to gold plates, preventing galvanic action. In his search for means of removing the roots of old teeth without pain, he tried stimulants, even to intoxication, opium, and magnetism, but in vain. While attending lectures at the medical college in Boston in 1844, for the purpose of increasing his knowledge with reference to this object, he learned that sulphuric ether could be inhaled in small quantities without danger; and after experimenting on himself, and becoming satisfied of its safety, he administered it to a man on Sept. 30, 1846, producing unconsciousness, during which a firmly rooted bicuspid tooth was painlessly extracted. After numerous other successful experiments, he communicated their result to Dr. J. C. Warren, and at his request administered the ether on Oct. 16, 1846, in the Massachusetts general hospital, to a man from whose jaw was removed a vascular tumor, the patient remaining unconscious during the operation. From this dates the introduction into general surgery of the discovery of ethereal anesthesia. Like other great discoveries, it met with bitter professional opposition. In order to protect himself against such opposition he obtained a patent for it, under the name of "letheon," in November, 1846, in the United States, and in the following month in England, offering, however, free rights to all charitable institutions in all parts of the country. Notwithstanding

his generous offers, government appropriated his discovery to its use without compensation. Several claimants for the honor of the discovery soon appeared, among whom was Dr. C. T. Jackson; and when the French academy examined the testimony, some of the members at first recognized him as the discoverer; but the committee of the academy awarded the Montyon prize of 5,000 francs to be equally divided between him and Dr. Morton. The latter declined to receive this joint award, protested against the decision of the academy, and in 1852 received the large gold medal, the Montyon prize in medicine and surgery. He had to contend with many troubles; his business was broken up, and his house was attached by the sheriff for debt; but his indomitable will and the encouragement of friends enabled him to maintain his claims. He presented his first memorial for compensation to congress in December, 1846, but the appointed committee did not report. Strengthened by the testimonial of the trustees of the Massachusetts general hospital in 1848, which conceded to him the discovery of the power and safety of ether in producing anesthesia, he made a second application to congress in January, 1849; a committee composed of physicians reported that he was entitled to the merit of the discovery, but they did not recommend any pecuniary remuneration. In December, 1851, he made a third appeal to congress, and his memorial was referred to a select committee; the report of the majority awarded the honor of the discovery to him, and in April, 1852, a bill was reported appropriating \$100,000 as a national testimonial, on condition that he should surrender his patent to the government. This bill was not acted upon directly, but having been brought before the senate as an amendment to the army appropriation bill, it was defeated. In 1853 an amendment to the appropriation bill was offered, granting \$100,000 to the discoverer of practical anesthesia; after a warm debate it passed the senate, 26 to 23, but failed in the house. In 1854 a similar bill passed the senate by 24 to 13, but was lost in the house. In the same year Morton attempted to obtain from the president a recognition of the validity of his patent, supported by the recommendation of 150 members of congress that the right to use his discovery be purchased for the public service, or that the government respect its own patent and discontinue its use; after two years' delay the president informed him that whenever it was decided in the courts that the government had violated his patent, it would pay. At this defeat his creditors became importunate, and reduced him to utter poverty; but in the winter of 1856-'7 a plan for a national testimonial was instituted in Boston, and an appeal was published signed by many of the principal physicians and merchants, in which they asserted an almost universal concurrence of the professional and other citizens

of Boston in assigning the merit of the discovery to Dr. Morton. In 1858 a similar appeal was made in New York, signed by the principal medical men of that city, and in 1860 also in Philadelphia. In 1858 he instituted a suit against a marine hospital surgeon for infringing his patent, as suggested by the president, which was decided in his favor in the United States circuit court. In the last years of his life he was engaged in agricultural pursuits, especially in the importation and raising of fine cattle at his farm in Wellesley, Mass. His death was caused by the excitement occasioned by an article attempting to deprive him of the honor of being the discoverer of anæsthesia; this attack brought on a fatal congestion and syncope. A monument in Mt. Auburn was erected by citizens of Boston, with the following inscription, written by Dr. Jacob Bigelow: "Wm. T. G. Morton, inventor and revealer of anæsthetic inhalation; by whom pain in surgery was averted and annulled; before whom, in all time, surgery was agony; since whom science has control of pain." The Montyon prize medal, his orders received from Russia and Sweden, and the silver box presented in Boston, are deposited in the rooms of the Massachusetts historical society, Boston. (See *ANÆSTHETICS*, JACKSON, CHARLES THOMAS, and WELLS, HORACE.)—See "Trials of a Public Benefactor," by Dr. Nathan P. Rice (New York, 1859).

MOSAIC (late Gr. *μουσαϊκος*, belonging to the muses, polished, elegant, or well wrought), the representation of a design by fitting together on a ground of cement numerous small pieces of stone and glass, of various colors, and generally cubical. Although one of the most mechanical of the fine arts, it is entitled to rank as a style of painting, from the fact that it requires the preparation of a cartoon or colored design, as in the case of a fresco or an elaborate oil picture, and no inconsiderable knowledge of form, color, and composition. Dating from a remote period, it has been transmitted to the present time, and in modern Italy has been carried to a higher degree of perfection than it attained at periods when it was almost the only species of pictorial art in vogue. Of the mechanical process employed, the following description of the practice in the establishment at the Vatican in Rome will convey an adequate idea: "The slab upon which the mosaic is made is generally of Travertine or Tibertine stone. In this the workman cuts a certain space, which he encircles with bands or cramps of iron. Upon this hollowed surface mastic or cementing paste is gradually spread as the progress of the work requires it, thus forming the adhesive ground or bed on which the mosaic is laid. The mastic is composed of calcined marble and finely powdered Travertine stone, mixed to the consistence of paste with linseed oil. Into this paste are stuck the *smalti* or small cubes of colored glass which compose the picture, in

the same manner as were the colored glass, stone, and marble *sectilia* and *tesserae* of the ancients. The *smalti* are vitrified but opaque, partaking of the nature of stone and glass, or enamels, and are composed of a variety of minerals and materials, colored for the most part with different metallic oxides. They are manufactured in Rome in the form of long, slender rods, like wires, of different degrees of thickness, and are cut into pieces of the requisite sizes, from the smallest pin point to an inch. When the mastic has sufficiently indurated (and it acquires in time the hardness of stone), the work is susceptible of a polish like crystal. Care must be taken, however, that by too high a polish the entire effect of the work is not injured, as innumerable reflected lights in that case would glitter in every part of the picture. When the design is to be seen at a very considerable distance, as in cupolas or flat ceilings, the work is generally less elaborately polished, as the inequalities of the surface are then less distinguishable, and the interstices of the work cannot be detected by the spectator." By this process many copies of large pictures by Raphael, Domenichino, and other old masters in the Vatican have been executed, occupying periods of from 12 to 20 years, and requiring from 10,000 to 15,000 different shades of the primary colors for the purposes of the work. In 1853 Pope Pius IX. sent to the crystal palace exhibition of New York a mosaic copy of Guercino's "St. John the Baptist," valued at \$60,000, which at a short distance it was impossible to distinguish from a highly finished oil painting. This, however, was a work of small importance in comparison with others preserved in the cathedrals of Europe. Two other species of mosaic work are carried on in Tuscany (whence the name, Florentine mosaics), the *pietre dure* and *pietre commesse*, both of which are employed for ornamental purposes, and represent fruit, flowers, birds, &c. The former gives the objects depicted in relief in colored stones. The latter consists of precious stones, as agates, jaspers, lapis lazuli, &c., cut into thin veneer and carefully inlaid.—The employment of mosaics, which have always possessed a certain value, as well from their imperishable nature as from their intrinsic merits as works of art, originated probably among those eastern nations by whom so many of the arts have been transmitted to Europe. The Romans acquired a knowledge of the process from the Greeks, who had borrowed it from the Asiatics; and by all of them it was originally applied as an ornament for pavements, the close imitation of inanimate objects scattered apparently over the floor being the chief aim of the artist. Large historical compositions, of which the mosaic representing the battle of Issus from the casa del Fauno in Pompeii affords a felicitous example, succeeded; and under the first Roman emperors the art attained a considerable degree of refinement, though still used chiefly as an

adornment for pavements. The Romans made it coextensive with their civilization, and from Britain to the Euphrates remains of ancient Roman mosaics have frequently been exhumed. Of the varieties in use among the ancients, the principal were the *pavimenta sectilia*, consisting of floors formed of pieces of stone of different colors, cut geometrically and cemented together; the *pavimenta tessellata*, or floors inlaid with small cubes of stone forming a colored design; the *opus vermiculatum*, and the *opus musivum*, in which colored cubes of clay or glass of every conceivable tint, set up very much as types are by compositors, were employed to produce elaborate finished pictures. The first three were included under the general name *lithostrotum*. With the overthrow of paganism and the establishment of the Christian religion commenced a new and grander era in the history of the art; and mosaics, from being used almost exclusively in pavements, were transferred to the walls and ceilings of sacred edifices. The connecting link between the mosaic pavements of Pompeii and the mosaics of Christian origin is so slight, that Dr. Kugler is "almost tempted to believe that historical mosaic painting of the grander style first started into life in the course of the 4th century, and suddenly took its wide spread." For nearly 1,000 years from this period it was almost exclusively employed for mural decoration, and from its durability has preserved a knowledge of the arts and in some degree of the religious ideas of the middle ages. From the 7th to the 9th century the most important and interesting remains of pictorial art are the mosaics in the churches and the manuscript illuminations; and the most ancient representations of the Virgin Mary now remaining are the old mosaics in the churches of Rome, Pisa, and Venice, referred to the latter half of the 5th century. —Christian mosaics admit of two general divisions, the later Roman and the Byzantine styles, the materials in use being in general cubes of colored glass, inlaid, in the Roman school, on a ground of blue or white, and in the Byzantine school on a gold ground, although in the latter the *tessere* are frequently irregular in size and the workmanship coarse. The former style flourished in Italy chiefly in the 5th and 6th centuries, the most splendid specimens of it being found in the churches of Rome and Ravenna. The churches of Sta. Maria Maggiore in the former city and of San Vitale in the latter contain perhaps the finest. When in the 5th century the arts and sciences were driven out of Italy by the distracted state of the country, they found refuge in Constantinople, where about the commencement of the 6th century arose that peculiar style pervading many branches of the fine arts, to which the general name of Byzantine has been applied, and which for five succeeding centuries had a predominant influence throughout Europe and among many eastern nations. The first and

greatest example of it is the celebrated church of St. Sophia, built by Justinian about the middle of the 6th century, and adorned with an almost incalculable wealth of mosaics, of which only a few colossal seraphim and the traces of a figure of the Madonna have escaped the effects of Mohammedan iconoclasm. By the middle of the 7th century it gained a foothold in Rome, where the native school of mosaics had lapsed into decay; and subsequently it came into competition with the Lombard, Norman-Byzantine, and Romanesque styles, each of which betrays the influence of the parent Byzantine. The mosaics in the church of St. Mark in Venice, executed between the 11th and 14th centuries, are perhaps the purest specimens of the style in Italy. They cover a surface of about 40,000 square feet of the upper walls, wagon roofs, and cupolas, and are laid upon a gold ground. Others, in a different style, were executed as late as the 16th century, Titian, Tintoretto, and contemporary masters, in some instances furnishing the cartoons; and the whole is fitly described as "a gigantic work which even all the wealth of Venice spent six centuries in patching together." In the 12th century a new or Romanesque style, founded upon Byzantine traditions, arose in Italy; and early in the 13th century the Italians in northern and central Italy, renouncing their dependence on Greek artists, began to execute mosaic work for themselves according to original conceptions of nature. Andrea Taffi, one of the earliest and most famous of the Italian *mosaicisti*, produced a figure of the Saviour 14 ft. high, which, Vasari says, spread his fame throughout Italy. Contemporary with and immediately succeeding him were Jacopo da Turrita, the Gaddi, Giotto, and others, of whom the last executed the celebrated *navicella*, now in St. Peter's in Rome. Among the latest of the *mosaicisti*, who worked from their own or original designs, were Baldovinetto, Gherardo, and particularly Ghirlandaio, the master of Michel Angelo, and Muziano, who brought the art to great perfection. At the commencement of the 17th century Clement VIII. employed numerous artists to decorate the interior of the dome of St. Peter's with mosaic copies of the works of eminent masters, and each succeeding century has added to the immense wealth in works of art of this description deposited in the church. In the 18th century Pietro Paolo Cristofori founded a school for mosaic in Rome, where the art is now practised on a grander scale than in any other part of the world.

MOSASAURUS, a gigantic fossil reptile, so named by Conybeare from its having been first found on the banks of the river Maas, near Maestricht in Holland, in the upper cretaceous formations of that district. It was referred to the orders of cetaceans and crocodilians, but A. Camper and Cuvier showed from the teeth and the skeleton that its true place was between the monitors and the iguanian lizards. The bones

of the head are like those of monitors; the teeth of the jaws are compressed, sharp-edged, supported on a socket in a shallow furrow, without true roots; there are teeth also on the pterygoid bones, as in the iguanians; there seem to have been 28 teeth in each jaw, with broad base and slightly curved. The head is elongated, and the mouth wide; the vertebrae concavo-convex, 34 from head to tail, the latter having nearly 100; as the articular processes are absent from the middle of the back, it has been inferred that



Mosasaurus (restored).

the body possessed greater flexibility than that of the crocodiles; the tail is compressed laterally, and has strong V-shaped bones below, indicating its use as a powerful swimming organ; the ribs have a single head; the humerus short and thick as in the ichthyosaurus, and the limbs probably flattened into fins as in enaliosaurians. It must have been a very active marine carnivorous animal. The best known species, *M. Camperi* (Conyb.), had a head 4 ft. long, while that of the largest living monitor is only 5 in., and the length of the animal must have been 25 ft. After the capture of Maestricht by the French (1794), these bones were sent to Paris. (See Cuvier's *Ossemens fossiles*.) This genus was abundant on the coast of New Jersey in the cretaceous epoch, and ten species have been described in the United States. Some of them attained a length of more than 50 ft. Their movements must have been rapid, by lateral undulations in the water, and serpent-like on land; according to Prof. Cope, they were probably able to coil themselves like snakes; they were veritable sea serpents of the cretaceous seas. *Clidastes* and *macrosaurus* were smaller and more slender allied genera. The genus *geosaurus* (Cuv.), found in the calcareous schists of Monheim, Bavaria, came nearer the crocodiles in the pelvis and thigh bones.—See "Proceedings of the Academy of Natural Sciences," pp. 91, 92 (Philadelphia, 1859).

MOSCHELES, Ignaz, a German composer, born of Jewish parents in Prague, May 30, 1794,

died March 10, 1870. At eight years of age he received musical instruction from F. D. Weber. In three years he became a skilful pianist; and at 14 he was introduced at Vienna to Haydn and Beethoven, and by their advice became the pupil of Albrechtsberger, with whom he made rapid progress. As a pianist he competed with Hummel, then reputed the first performer in Germany. After an extensive continental tour he in 1820 went to England, where he resided during the next 26 years. From 1825 to 1846 he was professor in the academy of London and conductor of the philharmonic concerts, after which he became musical professor in the conservatory of Leipsic. Probably no musician has so greatly influenced the cultivation in England of the classical music of Bach, Mozart, Beethoven, and kindred composers, or so fully developed a taste for pianoforte music and a knowledge of the resources of the instrument. As a performer of the sonatas and concertos of Beethoven he was without a superior. His compositions for the pianoforte are finished specimens of classical music, and his trios, quintets, &c., for the violin and other instruments, evince great theoretical knowledge. He translated into English Schindler's "Life of Beethoven," to which he added valuable notes.—See *Aus Moscheles's Leben*, edited by his wife (2 vols., Leipsic, 1872-'3), and adapted from the German by A. D. Coleridge (London, 1873).

MOSCHI, an ancient people of Asia, S. of the Caucasus, whose territory at the time of Augustus was divided between Colchis, Iberia, and Armenia, and from whom a mountain range extending from the Caucasus to the Anti-Taurus received the name of Moschic mountains. Their name, in early classical writers, frequently appears coupled with that of the Tibareni, and the two tribes are generally identified with the Meshech and Tubal of Scripture. (See JAPHETH.)

MOSCHUS, a Greek bucolic poet, of the 3d century B. C. He was a native of Syracuse, and a pupil or imitator of Bion. Four of his lost idyls and some small fragments of his poems are still extant, chiefly in the Doric dialect. They are usually joined with those of Bion and Theocritus. The best editions are those of Jacobs (Gotha, 1795), Wakefield (London, 1795), and Manso (Leipsic, 1807).

MOSCOW (Russ. *Moskva*). **I.** A central government of Russia, bordering on Tver, Vladimir, Riazan, Tula, Kaluga, and Smolensk; area, 12,854 sq. m.; pop. in 1867, 1,678,784. Its surface is low and undulating, and its soil is only moderately fertile. The climate is temperate in summer, but the cold is intense in winter. The navigable streams are the Oka and its tributaries, the Moskva and Kliasma. Cattle and horses are reared in great numbers, but the inhabitants are chiefly engaged in manufactures. It is divided for administrative purposes into 13 districts. **II.** A city, capital of the government, on the river Moskva, 390 S. E. of St. Pe-

tersburg; lat. of observatory, $55^{\circ} 45' 19''$ N., lon. $37^{\circ} 34' 4''$ E.; pop. in 1871, 611,970. It is surrounded by an earthen rampart more than 23 m. long. The enclosed space is an irregular trapezium, with an undulating surface, divided into unequal parts by the Moskva, which enters the circumvallation near the middle of the W. side and leaves it at the S. E. corner, finally joining the Oka, an affluent of the Volga. The little river Yausa, flowing from the northeast, joins the Moskva within the wall. About three fourths of the city lies on the N. bank of the Moskva, and one fourth on the S. bank. On the latter are the Sparrow hills, extending E. and W., which include nearly the whole S. part of the city. On the N. side the Kremlin (Russ. *Kreml*) occupies the principal elevation, directly on the bank of the river and very near the centre of the old city. From it radiate al-

most all the streets, like the spokes of a wheel, but with no regularity either of size or direction. Around the Kremlin, at a radial distance of 1 and $1\frac{1}{2}$ m. respectively, are two wide and well planted boulevards, laid out after the conflagration of 1812, each forming an irregular circle, the inner one terminating on the N. bank of the river, the outer one crossing the river and enclosing a portion of the city on the S. bank. Some of the principal streets were widened at the same time, but most of the smaller ones, as well as many of the buildings, were rebuilt on the old sites, so that many of the ancient characteristics have been preserved. Narrow lanes open into imposing squares, and the most stately buildings stand side by side with rows of humble cottages. The city, which has been fitly described as at once "beautiful and rich, grotesque and absurd,



The Kremlin, Moscow.

magnificent and mean," is unequalled in picturesqueness. Its thousands of spires, domes, and minarets, diverse in form and color; its Kremlin with high walls and fantastic towers; its gardens, boulevards, and squares; the strange intermingling of pagodas, temples, and churches, of Chinese tea houses and French cafés, of Turkish bazaars and Russian market places, present a strange yet attractive panorama, combining the most striking European and Asiatic characteristics.—There are five principal quarters, the Kremlin, Kitai-Gorod, Bieloï Gorod, Zemlianoi Gorod, and the Slobodi or suburbs. The Kremlin, the ancient citadel, is a nearly triangular enclosure surrounded with walls from 28 to 50 ft. in height and about $1\frac{1}{2}$ m. in circuit, with massive towers at each angle, and battlements, embrasures, and numerous smaller towers be-

tween. It is entered by five gates, to each of which is attached a religious or a historical importance. The principal one, the Spasski or Redeemer gate, is revered by all Russians, and no person, not even the emperor, passes it without uncovering the head and making obeisance to the faded picture of the Saviour above it. The Nikolski or Nicholas gate has an image of that saint over it, and is only second in sacred associations to that of the Redeemer. By the Troitski or Trinity gate the troops of Napoleon entered and left the Kremlin. Within the walls are cathedrals, churches, palaces, monasteries, and some of the finest public buildings and monuments of Moscow, with no symmetry of design, and of various styles and periods. The tower of Ivan Veliki (the Great), which looks down on all the surrounding spires, is an octagonal structure of five stories, its gild-

ed cross being nearly 325 ft. above the ground. In it are hung 34 bells, the largest of which weighs 64 tons. The Tzar Kolokol (see BELL) stands upon a granite pedestal near its foot.



Sacred Gate of the Kremlin.

The sacred buildings of the Kremlin are the cathedrals of the Assumption, in which all the Russian emperors since the days of Ivan the Terrible have been crowned; of the Archangel Michael, the burial place of the imperial family up to the time of Peter the Great; of the Annunciation, where the czars were formerly baptized and married; and the church of the Redeemer in the Wood, one of the oldest buildings in Moscow. Other ecclesiastical buildings within its walls are the Miracle monastery, the Ascension convent, and the sacristy or house of the holy synod, where are preserved the robes and the sacred vessels used by the different patriarchs. The palace is mostly modern, having been built chiefly by Czar Nicholas on the site of the old one burned in 1812. Within it are grand halls dedicated to the chief Russian orders of knighthood. The right wing, called the treasury, is devoted to

the preservation of arms, armor, relics, regalia, and other treasures illustrative of the history of the reigning dynasty and of Russia. At the N. angle of the Kremlin is the arsenal, a massive building in front of which are ranged long rows of captured cannon, among them 365 pieces taken from the French in the retreat from Moscow. Opposite the arsenal is the senate house, where sits the high court of appeal. —The Kitai-Gorod (Chinese town), E. of the Kremlin, is surrounded by a wall with 12 towers and 5 gates. It was enclosed by Helena, mother of Ivan the Terrible, when the Kremlin had become overcrowded. Within it the trade of Moscow has centred since 1596. The Gostinnoi Dvor, or great bazaar, is an immense building three stories high and covering three squares, intersected by numerous passages lined with shops. Each business has its separate department or street. The shops are small, but the store rooms above contain large quantities of goods, more than 75,000,000 rubles being invested beneath its roof. The Riadi also, a large open square laid out in narrow streets of booths, is in this quarter. In the Krasnaya Ploshchad (Red place) is the cathedral of Vasilii Blazhennoi (St. Basil the Beatified), sometimes called the cathedral of Kazan, because it was built by Ivan the Terrible over the remains of St. Basil, to commemorate the taking of Kazan. It is a building of two stories, with 11 domes and cupolas, each of different form, height, and color, and each surmounting a chapel dedicated to some saint. Other objects of interest in this quarter are the Romanoff house, where the founder of the present dynasty was born, the Strastni monastery, and the exchanges. —The Bieloï Gorod (white town) occupies the zone between the inner boulevard and the Kremlin and Kitai-Gorod. It contains many of the principal buildings, including the governor's palace, a fine building on elevated ground; the assembly house of the nobility, the grand hall of which will hold 2,000 persons; the university and the medical academy; the military riding school (560 ft. long by 158 broad), the roof of which is unsupported by any pillar, and which affords ample space for the simultaneous evolutions of 2,000 infantry and 1,000 cavalry; the foundling asylum, an immense quadrangular edifice, four stories in height above the basement, and having sometimes 25,000 children under its support, within and without its walls; the post office, the theatres, many private palaces, several monasteries and nunneries, and numerous churches. Among the last is the great temple of the Saviour, founded in 1812 to commemorate Russia's triumph over Napoleon, and not yet finished. It is a regular cross of four equal branches, surmounted by a central cupola 84 ft. in diameter, and having an exterior height above the pavement of 343 ft. The interior walls are cased with polished labradorite and porphyry, and adorned with paintings, and the outside is ornamented with bass reliefs repre-

senting Scriptural subjects and the events of the wars of 1812-'15. In the area in front are the statues of the Russian generals prominent in those times.—The Zemlianoi Gorod (earthen town), so called from the former earth rampart, now the outer boulevard, occupies the zone between the two boulevards. It contains the depot of the commissariat, the depot for spirits, the commercial school, the imperial philanthropic society, and many other public buildings, besides a large number of fine private residences. The Zatchateiski monastery, which takes its name from the church dedicated to the Zatchatiye or conception of St. Ann, is a great ornament to this part of the city. The church is a Gothic building, noted for the elegance of its interior. The Slobodi (suburbs) constitute all that part of the city outside of the Zemlianoi Gorod. Within its limits are most of the great monastic and benevolent institutions, a large number of churches, many parks and handsome residences surrounded by gardens, an imperial palace, the empress's villa, the race course, the St. Petersburg railway station, &c. Among the great hospitals are the Galitzin, Sheremeteff, St. Catharine, Alexander, St. Paul, and the military. The Novo-Dievitchie convent is a vast institution founded in the 16th century, with high walls surmounted by 16 towers. It has six churches, in the principal one of which are the tombs of many czarinas and princesses. Near it is the Dievitchie Pole or Maiden's field, where the people are entertained at the imperial coronations. The Seminoff monastery, dating from the 14th century, is also surrounded by walls with high towers, one of which is 125 ft. high. It has six churches and a belfry 330 ft. high. The Novospasski monastery has five churches and a belfry 235 ft. high. The Daniloff monastery, with white walls, and the Donskoi, with red walls and battlements, have many churches, chapels, cloisters, gardens, and courts within their bounds. Without the St. Petersburg gate, a short distance beyond the circumvallation, are the Petrovski palace and gardens, a fashionable summer resort. Napoleon retired to this palace when the Kremlin became untenable.—Moscow has nearly 400 churches, all of the orthodox Greek faith, with the exception of the English and Roman chapels, a German and a French chapel, two or three Armenian chapels, and a Turkish mosque. It is the seat of one of the three metropolitans of the Russo-Greek church, and is excelled in ecclesiastical importance by St. Petersburg only. It is the residence also of many of the great Russian nobles, particularly in the winter. Between it and St. Petersburg exists a literary rivalry, which has done much to stimulate intellectual activity. Its schools and seminaries are celebrated. The university, a state institution under the authority of the minister of public instruction, has 100 professors and teachers and usually about 1,500 students. It has a

library of 160,000 volumes, a cabinet of coins and medals, museums of natural history, a botanical garden, chemical laboratory, and observatory, a medico-chirurgical school and fine anatomical theatre, and a printing office. Among the other educational establishments are a Greek theological seminary, a practical commercial academy and a commercial school, an institute of oriental languages, five male and three female gymnasia, two military gymnasia and a military school, theatrical, mechanical, agricultural, veterinary, and other special schools, and numerous district and parish schools. The Catharine, Alexander, and Elizabeth institutes are for the education of young ladies of noble birth, and the Nicholas institute is for the instruction of female orphan children of the servants of the crown. There are several learned societies for the promotion of letters, art, and science; a public museum, with a library of 165,000 volumes and 5,000 manuscripts, a gallery of painting and sculpture, and a cabinet of coins and medals; and several other museums and libraries. Moscow is the centre of Panslavism, and, though not now the political capital, is the real heart of Russia and the richest and most characteristically Russian of all the cities of the empire. It is the residence of the general commanding the military circumscription of Moscow, consisting of 12 governments, and of a military and a civil governor general; and is the seat of a division of the directorial senate, consisting of the 6th, 7th, and 8th departments for criminal and civil affairs. For administrative purposes it is divided into 21 districts.—On account of its central position and superior facilities for transportation, Moscow is the great entrepot for the internal commerce of the empire. It has water communication with the Baltic, the Caspian, and the Black seas, and is connected by railway with St. Petersburg, Warsaw, Taganrog on the sea of Azov (by two lines, each with important connections), Nizhni Novgorod (with a branch to Kineshma), and Vologda. In the winter an enormous traffic is carried on by sledges with Tiflis and other places; and in 1874 a company was formed for trading with Afghanistan. It is also the centre of a great manufacturing industry, with several hundred establishments using steam power and the most approved machinery, and as many more in the surrounding towns and villages. Its chief manufactures are textile fabrics, principally of woollen, cotton, and silk, hats, gold and silver plate and jewelry, hardware, glass, porcelain, delft ware, paper, tapestry, chemical products, beer, brandy, and leather. Besides the Riadi and the Gostinnoi Dvor, there are many other market places where a large trade is carried on. The horse market is of great importance. The so-called winter market presents a remarkable appearance during the winter, when the fish of the White sea and northern lakes, frozen oxen from the Crimea, Caspian sheep, and deer from the banks of the Irtysh and Yenisei, are

piled together. Industrial exhibitions and fairs often take place in the city.—Moscow is said to have been founded in the middle of the 12th century by George Dolgoruki, prince of Kiev. Ivan Danilovitch of Vladimir took the title of grand prince of Moscow in the early part of the 14th century, and it remained the seat of government from that time until the beginning of the 18th, when the administration was transferred by Peter the Great to St. Petersburg. Moscow was plundered by the Lithuanians and the Tartars of Tamerlane in the latter part of the 14th century, and subjected to many vicissitudes in the 15th and 16th. It was nearly consumed by fire in 1536, in 1547, and again in 1571, when the Tartars set fire to the suburbs, and a large part of the population perished. During the insurrections caused by the pseudo-Demetriuses (1605-'12), when the Poles and Cossacks took the city, it was again partly destroyed. In 1812 it was entered by the French under Murat, on Sept. 14, and on the 15th by Napoleon, who took up his residence in the Kremlin. The city, deserted by its inhabitants, was set on fire by order of the governor, Count Rostoptchin, compelling Napoleon to leave on Oct. 19, and to take his final departure on the 23d, and resulting in the disastrous retreat of the French army. The greater part of the city was then destroyed, notwithstanding the efforts of the French to stay the progress of the flames; but it was rebuilt within a few years.

MOSELEY, Henry, an English scientific writer, born about 1802, died Jan. 20, 1872. He took his degree at St. John's college, Cambridge, in 1826, took orders, and for several years he was professor of natural philosophy and astronomy in King's college, London. He was one of the first of the clergy to officiate as inspector of schools, and his services to education led to his being made in 1853 canon of Bristol cathedral. He afterward became vicar of Olveston, and in 1855 chaplain to the queen. He published several scientific works, the best known of which are "Treatise on Mechanics applied to the Arts" (London, 1847), and "Mechanical Principles of Engineering and Architecture" (1855).

MOSELLE (Ger. *Mosel*; anc. *Mosella*), an affluent of the Rhine, which rises in France, in the S. E. corner of the department of Vosges, and flows N. and N. W. to Toul, in the department of Meurthe-et-Moselle (formerly Meurthe); thence its course is N. E. till it is joined by the Meurthe, when turning N. it passes through the former department of Moselle (now German Lorraine), and for over 20 m. forms the boundary between Rhenish Prussia and Dutch Luxemburg. Then again turning N. E., it flows through Rhenish Prussia to Coblenz, where it falls into the Rhine. The Moselle is about 320 m. long, more than 160 m. of which is through France. Its chief tributaries are: on the right, the Meurthe, Seille, and Saar; on the left, the Madon, Ornes, and

Sure or Sauer. The principal cities on its banks are Toul, Metz, Treves, and Coblenz. It is navigable for more than 200 m., or from its junction with the Meurthe to its mouth.

MOSELLE WINES. 'See GERMANY, WINES OF, vol. vii., p. 775.

MOSEN, Julius, a German poet, born at Marieney, Saxony, July 8, 1803, died Oct. 10, 1867. He was the son of a schoolmaster, and studied jurisprudence at Jena and Leipsic. After filling some inferior judicial stations in the provinces, he removed to Dresden, where he practised his profession, and established a reputation as a poetic and dramatic writer. In 1844 he was appointed dramatic writer to the court theatre in Oldenburg. Among his published poems are: *Lied vom Ritter Wahn* (1831); *Gedichte*, including *Andreas Hofer* (1836); and *Ahasver* (1838). His principal tragedies are: *Die Bräute von Florenz* and *Wendelin und Helena* (1836); *Kaiser Otto III.* (1840); *Bernhard, von Weimar* (1855); and *Der Sohn des Fürsten* (1858). He wrote also the dramas and comedies *Heinrich der Finkler* (1836), *Cola Rienzi* (1836), *Johann von Oesterreich* and *Die Wette* (1842); and several fanciful novels, the principal of which is *Bilder im Moose* (1846). His collected dramatic works were published in Stuttgart in 1862, and his complete works in 8 vols. in Oldenburg (1863-'4) and in Leipsic (1871).

MOSENTHAL, Salomon Hermann, a German dramatist, born of Jewish parentage in Cassel, Jan. 14, 1821. He took his doctor's degree at Marburg in 1842, became private tutor in Vienna, and in 1851 archivist in the Austrian ministry. His *Deborah* (Pesth, 1850) and *Sonnenwendhof* (Leipsic, 1856) have been adapted to the English, Italian, Danish, Hungarian, and Bohemian stage; and he has written many other dramas, among which is the tragedy *Pietra* (1865). His *Gesammelte Gedichte* appeared in Vienna in 1866.

MOSER, George Michael, an English enameller, born in Schaffhausen, Switzerland, about 1705, died in England, Jan. 23, 1783. According to Sir Joshua Reynolds, he excelled in his profession, had a universal knowledge in all branches of painting and sculpture, and "may truly be said in every sense to have been the father of the present race of artists." He was an original member of the royal academy, and for many years keeper of that institution, in which capacity he instructed the students in drawing and modelling from the antique.—His daughter MARY (LOYD), distinguished as a flower painter, was the only woman, with the exception of Angelica Kauffmann, ever a member of the royal academy. She died at an advanced age, May 2, 1819.

MOSER, I. Johann Jakob, a German jurist, born in Stuttgart, Jan. 18, 1701, died there, Sept. 30, 1785. He was educated at the university of Tübingen, where at the age of 19 he was appointed teacher, and in 1727 professor of law. In 1736 he was made director of the

university of Frankfort-on-the-Oder, but resigned in 1739. In 1749 he founded at Hanau an academy for the instruction of young nobles in political science. In 1751 he returned to Württemberg, where he was imprisoned from 1759 to 1764 for memorializing the duke on the rights of the estates. He was the first to give a systematic account of European international law. His works are very numerous, embracing the voluminous *Deutsches Staatsrecht* (Nuremberg, 1737-'54), with various supplements. **II. Friedrich Karl von**, a German publicist, son of the preceding, born in Stuttgart, Dec. 18, 1723, died in Ludwigsburg, Nov. 10, 1798. He was for many years imperial councillor at the court of Vienna, and afterward a member of the administration of Hesse-Darmstadt. His *Der Herr und der Diener* (1759), exposing administrative abuses, created a great sensation. He exerted a still greater influence by means of the *Patriotisches Archiv*, which he edited from 1784 to 1790, and which was followed in 1792-'4 by the *Neues Patriotisches Archiv*. He also wrote on international law, and is the author of a *Geschichte der Waldenser* (Zürich, 1798), and of *Luther's Fürstenspiegel* (new ed., Frankfort, 1834).

MÖSER, Justus, a German author, born in Osnabrück, Dec. 14, 1720, died there, Jan. 8, 1794. He studied jurisprudence at Jena and Göttingen, and became government attorney in 1747; and for 20 years during the minority of the duke Frederick of York, who came into possession of Osnabrück in 1764, he was the principal adviser of the regent. He was afterward a judge. One of his most celebrated humorous works is his *Harlekin*, directed against pedants and hypocrites of all kinds. In his work on the German language and literature he attacks the Gallomania and infidelity of Frederick the Great; and in a letter addressed to Jean Jacques Rousseau he opposes the theories of that philosopher. His most important contribution to literature is his *Osnabrückische Geschichte* (2 vols., 1768; 3d ed., 1820; vol. iii. published from his literary remains by Herbert von Bar, 1824). His short essays, *Patriotische Phantasien* (4 vols., 1774-'86), relate to local subjects. A complete edition of his works was published by Abeken (10 vols., Berlin, 1842-'3).

MOSER. See HEBREWS, vol. viii., p. 583.

MOSHEM, Johann Lorenz von, a German ecclesiastical historian, born in Lübeck, Oct. 9, 1694, died in Göttingen, Sept. 9, 1755. He was educated at the gymnasium of Lübeck and the university of Kiel, where he became professor of philosophy. From 1723 to 1747 he was professor of theology at Helmstedt, and afterward till his death divinity professor and chancellor of the university of Göttingen. He was the author of a large number of works, the principal of which are *Institutiones Historiæ Ecclesiasticæ, Antiquioris et Recentioris* (2 vols., Helmstedt, 1726), and *De Rebus Christianorum ante Constantinum Magnum Com-*

mentarii (1753). The best English translation of these works is by James Murdock, D. D., "Institutes of Ecclesiastical History" (3 vols., New Haven, 1832; revised, New York, 1839), and "Commentaries on the Affairs of the Christians before Constantine" (2 vols., New York, 1855).

MOSKVA, Battle of the. See BORODINO.

MOSLEMS. See MOHAMMEDANISM.

MOSQUE (Arab. *mesjid*, "place of prayer"), a Mohammedan temple or house of worship. The first mosque was erected by Mohammed at Medina, part of the work being done by his own hands. The site was a graveyard shaded by date trees, which was selected by the prophet because his camel knelt opposite to it on his public entry into the city. The edifice was square and capacious, the walls of earth and brick, and the roof supported by the trunks of palm trees and thatched with palm leaves. It had three doors. A part of the building was assigned as a habitation to the poor among the faithful who had no other homes. In this mosque Mohammed was buried; and though the original edifice was long ago replaced by a larger structure, the temple still bears the name of *mesjid en-nebi*, "the mosque of the prophet," and has ever since served as a model for the construction of Mohammedan places of worship. Everywhere the mosque is substantially the same in plan, though differing in detail in some countries, as modified by national taste. What in Arabia was simple and elegant became highly ornate in Spain, florid in Turkey, and effeminate in India. In the reign of the caliph Walid I., toward the end of the 1st century of the Hegira, the cupola and the minaret were added to the mosque, and the Saracenic style of architecture was introduced throughout the Moslem world. The mosque of the prophet at Medina, the great mosque at Mecca, and the mosque of Omar at Jerusalem, are considered peculiarly holy, and are among the finest extant specimens of Moslem architecture. Cairo has about 400 mosques, the chief of which, that of Sultan Hassan, is a majestic edifice in the purest style. The *jumma musjid* or great mosque at Delhi, built by Shah Jehan in 1631-'7, is generally considered the noblest building ever erected for Mohammedan worship. The principal mosque of Constantinople was originally the Christian church of St. Sophia. The mosque of Solymán the Magnificent, begun in 1550 and finished in 1555, has six minarets. Attached to this mosque, as to almost all others, are various endowments for institutions of education, piety, and benevolence. It has an annual revenue of 300,000 piasters.

MOSQUITO. See GNAT.

MOSQUITO COAST. See NICARAGUA.

MOSSES (*musci*), a large family of cryptogamic plants, the study of which forms a distinct department of botany called bryology (Gr. *βρύον*, moss), or muscology. Mosses have distinct stems, leaves, flower-like reproductive

organs, and seed-like bodies or spores which serve to propagate the species. They are cellular, and bear only a faint resemblance to the higher orders of plants. The stem of the mosses consists of cells of different forms and sizes, as may be readily seen by a transverse section, where those of the circumference are smaller and polyhedral, while those of the centre are elongated and by a closer arrangement approximate a woody texture. The stem, when it rises upward and ends in the organs of reproduction, is said to be determinate, and such a moss is acrocarpous; but when it extends lengthwise and laterally in an indefinite manner, it is said to be indeterminate, and the moss is pleurocarpous, because the reproductive organs are borne upon the side branches. The leaves of mosses are always sessile, and usually clothe the stem; but in some species the lower part is bare, or at least only covered with a few leaf-like scales. There are two distinct kinds of leaves: 1, those which grow upon the stem, and are called cauline; 2, those which surround the reproductive organs, and are called perichætal when they surround the fertile organs, and perigonal when around the male. These latter are more closely set than are the others, forming a sort of rosette in the centre of which the reproductive organs are lodged. The leaves of mosses are very simple, and usually consist of a single cellular layer, and they are destitute of stomata. They easily imbibe moisture, and as suddenly wither. A passing shower will revive the mosses which grow upon the driest rocks. The cells of the leaves are comparatively large, but the size differs greatly in different species. Each cell usually contains chlorophyll, though the cells of the *sphagnum* appear to be destitute of this principle. The cells are often uniform in size and general shape, except those toward the central portion of the leaf, where they assume an elongated form and constitute themselves into a sort of rib, nerve, or vein, which either bifurcates at the base and shortly ceases, or is produced into a single nerve and continues through the greater length of the leaf, or even extends beyond the apex and ends in a sort of point. The cells upon the edges of the leaf are sometimes modified into a border or into serrated processes like teeth. Sometimes several laminæ are produced along the midrib or nerve of the leaf, and sometimes granules or bulbules are produced there. Buds or innovations are also sometimes to be met with in the axils, which when separated can become new plants. With regard to the stem, the phyllotaxis or position of the leaves is one-two, two-five, or three-eight.—The floral or reproductive organs are of two kinds: 1. What may be regarded as the sterile or male flowers, the *antheridia*, consisting of cylindrical, pear-shaped, or ellipsoidal stalked sacs containing a granular mucilage, which when the antheridium is mature is expelled from an opening in the apex; it consists of spherical hyaline cells

from $\frac{1}{100}$ to $\frac{1}{50}$ of an inch in diameter, each containing a filiform antherozoid, which is furnished with two minutely slender, vibrating hairs. The antheridia are accompanied by



Sterile Inflorescence. 1. A sterile Stem. 2. Antheridia (one emitting antherozoids) and Paraphyses. 3. Antherozoids.

cellular jointed filaments called *paraphyses*. 2. The *archegonia*, which may be compared to fertile or pistillate flowers, are usually flask-shaped bodies, mixed, like the antheridia, with paraphyses, and like them produced within small clusters or rosettes of leaves. The cavity of the archegonium contains a free cell or nucleus, enveloped by mucilage; after fertili-



Fertile Inflorescence. 1. A fertile Stem. 2. Capsule with its Calyptra. 3. Capsule deprived of Calyptra, showing the Operculum. 4. The same with Operculum removed, exposing the Peristome and Epiphragm.

zation the archegonium elongates, as does its enclosed nucleus; but the nucleus grows much more rapidly than the archegonium, which at length is ruptured, its upper part forming a

cap, called the *calyptra*; the nucleus in elongating forms a slender bristle, still capped by the calyptra, and when it has attained its full length the portion within the calyptra expands, and forms a capsule (*theca*, or urn), which is known as the fruit of the moss. The lower portion of the ruptured archegonium remains at the base of the bristle as a *vaginula* or sheath. In general, a single archegonium only becomes perfect and undergoes these changes. These two distinct kinds of floral organs sometimes exist in the same flower and are enclosed in the same perichætium, when the moss is called syncæious; if, however, the antheridia occur on one part of the plant and the archegonia on another part, the moss is called monœcious; and when each kind of organ occurs on separate plants, the moss is dicecious. The importance of these differences in the mosses is apparent from the fact that some species produce in some countries only barren flowers or antheridia, and consequently can never be found there in fruit, a condition always desirable to those who collect for herbariums. It has been well ascertained that where the antheridia are wanting the archegonia never come to perfection; and there are some dicecious species of *hypnum*, for instance, which are usually destitute of capsules from that cause.—The capsule, *sporangium*, or *theca* of mosses is cellular, has a central axis called the *columella*, and contains spores. In some instances the sporangium is indehiscent (*e. g.*, *phascum*); in other cases it opens by four lateral valves (*andrea*), but in the majority of mosses it opens by means of a lid (*operculum*). This lid is thrown off when the sporangium is mature. Between the base of the lid and the edge of the mouth of the capsule or sporangium are frequently several rows of large cells forming a sort of ring (*annulus*), which distend themselves and assist in the dispersion of the spores. The edge of the mouth of the capsule in some mosses is entire (*e. g.*, *gymnostomum*), or it has a fringe (*peristome*) consisting of prolongations and divisions of the two inner parietal layers of the capsule. The peristome consists of one or more rows of hygrometric cellular teeth, which are four or some multiple of that number. Where but a single row exists, the mosses are classed as *aploperistomi*, and where there are double rows as *diploperistomi*. The teeth are long and twisted together in *barbula*, or bifurcate in *dieranum*, or assume a variety of shapes, marking the different genera. In some mosses the inner parietal layer appears as a membrane called the epiphragm or tympanum, stretched across the mouth from the walls of the sporangium to the columella. The capsule does not always rest in a perpendicular manner upon the seta, but may be inclined to one side, and bent downward or cernuous; and in some mosses one side of it is more developed than the other, producing an unsymmetrical shape. Sometimes there is a considerable thickening or swelling at its base, to which

the name of *apophysis* is given. The interior of the mature capsule is filled with a profusion of dust, which however will be found to consist of round bodies, which are in fact the spores or seeds. When they have been ejected from the capsule, they are in a condition to grow. From some part of their surface a bladder-like swelling protrudes, which after a while extends itself by increase of similar ones into a confervoid thread. An entangled mass of such threads soon covers the soil, or the moist surfaces of substances on which the spores have fallen. So much do these threads resemble some of the algae, that they were mistaken for them by the earlier botanists. This confervoid vegetation continues from 5 to 20 days, when upon its surface very small buds appear. On examination these buds will be found to be composed of minute scaly leaves; and thus the axis or future stem is originated at their base. In some genera the moss scarcely develops itself beyond this condition, forming its fruit in the interior of the scale-like foliage. In other kinds of mosses the plants grow for a shorter or longer period of time before the inflorescence appears. These confervoid threads have been compared to the primordial leaves of the higher orders of plants; they differ however in this, that on disappearing from the surface of the soil, similar threads penetrate it and seem to careless observers to be the roots. In many mosses such seeming roots are pushed from the under side of the stem, or even from the very extremities, in the progress of its growth.—Very little is known of the uses of the mosses. In the economy of nature they serve as precursors of the higher plants, appearing first upon sterile places, and collecting among their matted and tufted stems the dust and sand. They afford secure lodging places for insects in winter, as well as food for them in summer. Some species of *sphagnum* enter largely into the formation of peat bogs; in these localities the moss continues to grow above while it is constantly decaying below; a great number of woody plants are found growing with the sphagnum, and these decaying together with the moss form peat of various qualities. Some botanists regard sphagnum as sufficiently different from other mosses to form an order by itself (*sphagna*), intermediate between the true mosses and the liverworts. When first taken from the bog sphagnum is very wet, but if thor-



Peat Moss (*Sphagnum acutifolium*).

oughly squeezed or partly dried it serves an excellent purpose in the transmission of trees and plants by packing their roots in the spongy and elastic mass; indeed for this purpose it is superior to all other packing materials; it may be made to contain just the requisite amount of moisture, and it does not readily decay. It is also much employed by gardeners as a medium in which to grow orchids and plants that are naturally inhabitants of bogs, and for these uses it is a regular article of trade. Some *hypna* retain their elasticity on being dried, and serve for stuffing pillows. The Laplanders use turfs of *polytricha* for mattresses. Little brooms are sometimes made of these mosses. In dense forests (in the northern hemisphere) the northern side of trees is usually more thickly covered with mosses than the other sides. Some fanciful medicinal qualities are attributed to a few kinds.—The geographical distribution of the mosses is very extensive; scarcely any part of the earth's surface is destitute of them, from the polar regions to the equator. They constitute with lichens almost the only vegetation on the coast of the Polar sea, where the soil never thaws to a depth of more than a few inches. The northern seacoast of Siberia is an immense morass whose entire surface is covered with mosses. The schistose rocks of Spitzbergen, rising above the everlasting ice, are, according to Martens, covered with these plants. They enter largely into the flora of Greenland; the loftiest Swiss Alps, and the volcanic scorïæ of Iceland, afford abundant species. Montagne in his *Sylloge* exhibits species from almost every portion of the globe, and the various exploring expeditions find these forms of vegetation wherever they have visited.—The earliest writer on the mosses who comprehended their structure was Micheli, who in 1729 described and depicted the most minute portions of their reproductive organs, and seems to have understood their purposes. On the other hand, Dillenius (1741), Linnæus (1753), and Adanson (1763) regarded the sporangium as analogous to the anther of the phanogamous plants. Schmiedel in 1760, and subsequently in his *Icones Plantarum et Analyses Partium* (1762-'97), described and figured the *zootheca* of the *hepaticæ*; and, struck with finding them filled with a mucilaginous fluid analogous to that which fills the pollen grains, he considered them as male organs, and gave the name of female organs to the sporangia of mosses. Hedwig (*Theoria Generationis*, 1784) and other botanists now adopted the same view, until H. Mohl in 1833 showed that the spores of the *hepaticæ* and mosses were developed exactly like the pollen grains, and that the ideas of Linnæus and others of that school were in a measure correct. We have seen, however, that the antheridia with their enclosed antherozoids seem to be essential in the production of the sporangium and its contents. In the United States the mosses were perhaps first collected by Dr. Muhlen-

berg, of Lancaster, Pa. He sent many American species to Hedwig, and they were described and published in the *Species Muscorum* (Leipsic, 1801). In 1813 Muhlenberg's *Catalogus Plantarum Americæ Septentrionalis* appeared, in which he gives the names of more than 170 species. The value of this list is apparent, when it is known that his correspondence abroad was extensive and highly prized. Many of the species in Bridel's *Bryologia Universa* (Leipsic, 1826) were from contributions of Dr. Torrey of New York, who at that time had made ample collections of cryptogamic plants; and mention is frequently made by the same author of the names of Cooley and Dewey, who likewise furnished specimens. Those of Newfoundland had been collected by De la Pylaie. A synoptical table of the ferns and mosses of the United States was published in 1828 in the "American Journal of Science and Arts," vol. xv., by Dr. Lewis C. Beck. A list of the mosses of Massachusetts is appended to the second edition of Prof. Hitchcock's "Geological Report" of that state. The mosses of the British possessions in North America were collected by Drummond, the author of *Musci Scotici*, who accompanied Franklin in his second land expedition in 1825. These subsequently appeared in sets of mounted specimens published by William Wilson at Glasgow in 1828; they were choice and valuable. In the Boston "Journal of Natural History" for 1845 (vol. v.) is a paper by John L. Russell on some species noticed by him in eastern Massachusetts; and in Hovey's "Magazine of Horticulture and Botany" for 1847, vol. xiii., is a valuable list of White mountain species prepared by William Oakes, who had made that region of New England his special study. In the catalogue of the plants of Cincinnati, Ohio, by Thomas G. Lea, are more than 80 species collected by him. In Agassiz's "Lake Superior, its Physical Character, Vegetation," &c. (Boston, 1850), the mosses of that region are elaborated by Lesquereux. Dr. Darlington, in the second edition of his *Flora Cestrica* (Philadelphia, 1853), furnishes a list of species detected within the limits of Chester co., Pa., and prepared by Thomas P. James. The *Musci Alleghanienses* were issued from Columbus, O., in 1855, in two fascicles (4to), consisting of 215 species and well marked varieties of mosses, and 177 species of *hepaticæ*. Fifty copies only of this superb work were printed for private distribution among the friends of the author. These specimens were collected by William S. Sullivan and Prof. Asa Gray, in a tour along the Alleghany mountains from Maryland to Georgia in 1853. A similar work from the joint studies of Lesquereux and Sullivan, consisting of 355 mounted specimens, and entitled *Musci Boreali-Americani* (Columbus, O., 1856), full of rich and well fruited species, and thus giving a view of the muscology of North America, furnishes ample materials for comparison. In the second edition of Prof. Asa Gray's "Man-

ual of the Botany of the Northern United States" (1856) Mr. Sullivant gave descriptions of all the species known eastward of the Mississippi river; but in subsequent editions of the "Manual" these are omitted, and they have been published in a separate volume as "The Musci and Hepaticæ of the United States east of the Mississippi River." A most important aid to the student is "The Icones Muscorum, or Figures and Descriptions of most of those Mosses peculiar to Eastern North America which have not heretofore been figured." This, also by Mr. Sullivant, is a handsome volume, with 129 copperplates, each illustrating several species. A description of the mosses and liverworts found on the United States Pacific railroad expeditions and surveys, with figures of the rarer and new species by Mr. Sullivant, can be found in the fourth volume of the executive documents (senate) of the 33d congress, second session (Washington, 1856). Other valuable contributions in this branch of botany from the same pen are to be seen in the "Memoirs of the American Academy of Arts and Sciences" (Boston, 1848, &c.). The species found in Wisconsin are given by I. A. Lapham, in the fifth volume of the "Transactions of the Wisconsin State Agricultural Society" (1860). Many novelties likewise have been brought to notice through the labors of C. C. Frost of Brattleboro, Vt., and by Prof. D. C. Eaton of New Haven, who have minutely examined that region. Mr. C. F. Austin, of Closter, N. J., has published named collections of mosses. The "Bulletin of the Torrey Botanical Club" (monthly, New York) contains important contributions to our bryology by Mr. Austin, and, especially with reference to southern and far western species, by Dr. Carl Müller of Halle, Germany.

MOSTAR, a town of European Turkey, in the vilayet of Bosnia, capital of Herzegovina, on both sides of the river Narenta, 38 m. S. W. of Bosna-Serai, in lat. 43° 20' N., lon. 17° 58' E.; pop. about 18,000. The buildings of the town are scattered over a plain through which the river runs, and the only noteworthy ones are the governor's palace and a few of the mosques, of which there are more than 30. There is also a Greek church, and the town is the residence of the Greek metropolitan of the district. There are two bazaars, and an extensive trade is carried on in agricultural products and silk. Mostar was founded about 1440, and named after the bridge crossing the Narenta at this point (*Most Star*, old bridge), which was probably built in the time of Trajan or Hadrian, and still connects the two portions of the town. It consists of a single Roman arch, 95 ft. in span and about 80 ft. above the stream in summer.

MOSUL, or **Mossul**, a town of Asiatic Turkey, capital of a district of the same name in the vilayet of Diarbekir, on the right bank of the Tigris, 220 m. N. N. W. of Bagdad; pop. about 40,000, of whom 9,000 are Christians, 1,500

Jews, and the rest Arabs, Turks, and Kurds. Its fortifications are dilapidated. The streets are narrow and irregular; the houses, mostly built of a composition of pebbles, lime, and clay, have flat roofs surrounded by parapets, and the stairs are always on the outside. It is one of the chief centres of the Jacobites, their bishop, next in rank to the patriarch, residing in a neighboring convent; there are also United Syrian and Chaldean bishops, and the Chaldean patriarch of Babylon usually resides here. It once had considerable commerce, and it is still a thoroughfare for the trade between Bagdad, Syria, and Constantinople. Its manufactures are chiefly coarse cottons and shawls. In the middle ages it was noted for its muslin, with which it supplied Europe, and which derived its name from this place. The climate is very hot in summer, but the winters are mild and agreeable. In the vicinity are several hot sulphur springs which are much frequented. Mosul is chiefly interesting as being near the site of Nineveh, whose remains exist in great mounds on the opposite side of the river, excavated by Botta and Layard.

MOTAGUA, Rio. See GUATEMALA, vol. viii., p. 289.

MOTH (*phalæna*, Linn.), the common name of the third and last section of the order *lepidoptera*, the other two having been described under BUTTERFLY and HAWK MOTH. This section includes a great number of nocturnal insects, also called night butterflies and millers, including all that cannot be arranged under the other sections. They vary greatly in size, color, and form; while those with gilded wings are very minute, the atlas moth of China (*attacus atlas*) covers a space 9 by 5½ in. with its expanded wings, and the owl moth of Brazil (*erebus strix*) expands 11 in. The antennæ are usually tapering, either naked or feathered, varying according to sex, and ampler in the males; the wings are bridled by bristles and hooks, the first pair covering the posterior, and sloping when at rest; some females have very small wings or none at all; the hind legs have two pairs of spurs. The tongue in most consists of a sucking tube formed of two hollow threads, rolled up when not in use; in some it is very short or wanting; there are generally two feelers, curving upward from the lower lip. The legs in the larvæ vary from 10 to 16; some in this condition are smooth and naked, others hairy uniformly or in tufts, others warty or spiny; some enclose themselves in silken cocoons (as the silkworm), others enter the ground, or undergo their change in the interior of plants; the chrysalids are oval without angular elevations. Most moths conceal themselves by day, flying only at night and during the warm season; a few, as some *bombyces*, fly by day and in the brightest sunlight. Modern entomologists generally recognize seven groups, as follows: I. *Bombyces* or spinners, including Latreille's four sections of *hepialites*, *bombycites*, *pseudo-bombyces*, and *aposa*. This, the

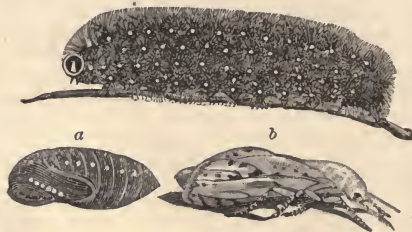
largest group, was so named from *bombyx*, the old name of the silkworm, and its members are generally thick-bodied, with feathered antennæ (at least in the males), very short or no feelers, with woolly thorax, and the fore legs often hairy; the caterpillars have 16 legs, and in most cases spin cocoons in which metamorphosis takes place. After Boisduval, Dr. Harris divides this group into nine families: 1. *Lithosiada*, so called from their caterpillars living in stony places and often feeding on the lichens growing upon rocks. Many of the species are very handsome, but injurious from devouring grass; they are small, slender-bodied, with long bristly antennæ, narrow fore wings, and smooth back; they often fly in the daytime; their caterpillars are sparingly clothed with hairs growing in clusters from small warts, and enclose themselves in cocoons of silk interwoven with their own hairs; the rings of the chrysalids are closely joined. The most elegant species is the *deiopeia bella*, with white body, thorax dotted with black, fore wings deep yellow crossed by about six black-dotted white bands, the hind wings scarlet bordered with black behind, and a spread of about 1½ in.;



Deiopeia bella.

it can hardly be called injurious to vegetation. 2. *Arctiada*, tiger and ermine moths, called woolly bears from the thick hairy covering of most of their caterpillars. The tongue is generally very short, and the antennæ doubly feathered on the under side, hardly visible in the females; feelers shorter and thicker than in the preceding family; wings roofed on each side, thorax thick, abdomen short and plump, generally with black spots; they fly only at night. The hairy caterpillars run very fast, and when irritated roll themselves into a ball; some, like the salt-marsh caterpillar and the yellow bear, are very injurious to vegetation; when about to change they creep into a protected place, and make a cocoon of their own hairs and a little silk; the chrysalis is smooth, with movable joints. Most of our tiger and ermine moths belong to the genus *arctia* (Schr.). The largest is the *A. virgo*, which gives out a very disagreeable odor; it expands 2½ in., and the wings are reddish; the larva is brown. The great American tiger moth (*A. Americana*), represented in Europe by the *A. cajo*, expands 2½ in.; the fore wings are brown marked with white, and the hind ochre yellow spotted with blue black, and with a white edge on the collar; the caterpillar is blackish brown. The yellow bear (*A. [S.] Virginica*) is very common and destructive in gardens, devouring almost all kinds

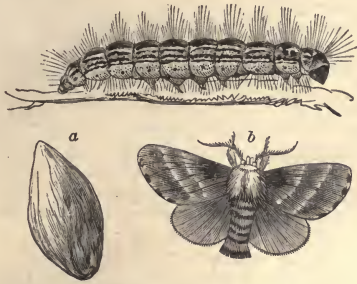
of plants; the moth is called the white miller, and would be called an ermine moth in England. The salt-marsh caterpillar (*A. [S.] acraea*) is a great pest to the salt-hay crop; it appears to-



Salt-marsh Caterpillar (*Arctia acraea*).
a. Pupa. b. Moth.

ward the end of June, attaining the full size during August, nearly 2 in. in length. The Isabella tiger moth (*A. Isabella*) is remarkable for the stiffness and evenness of its hairy covering, black toward the head and tail and tanned between, with black body and head; the moth is tawny yellow with black dots, and the antennæ are not feathered. Some arctians devour the leaves of trees, the most familiar and destructive of which are the fall web worms (*A. [S.] textor*); the brood make a web in common, sometimes extending over entire branches, and feed in company under its protection, devouring the upper and pulpy portion of the leaves; when full grown they are a little more than an inch long, and are thinly clothed with hairs; the general color is greenish yellow dotted with black, the head and feet black; the moths are white, with tawny yellow fore thighs and blackish feet; the wings expand about 1½ in. For full descriptions of these and other arctians, see Dr. Harris's work on "Insects Injurious to Vegetation." 3. *Liparida*, so called from the thickness of the body of the females, which are sometimes destitute of wings, while the slender males have broad wings; the antennæ are bowed and doubly feathered below; the feelers are very hairy, as are the fore legs; the males sometimes fly by day. The caterpillars are in most half naked, the thin hairs growing chiefly on the sides; they are called tussocks in England, and have sometimes proved very destructive there; they are far less common and injurious in this country, where they are called vaporer moths; they belong to the genus *orgyia*, among others. 4. *Lasiocampada*, with very thick woolly bodies, without the usual bristles or hooks to the wings, with the front edge of the hind wings turned up; the larvæ are generally not warty, and are sparingly clothed with short soft hairs, mostly on the sides; both sexes are winged, and fly only at night. Here belong the tent or lackey caterpillars so common in neglected orchards; the eggs are placed as little cylinders around the ends of branches, and the larvæ when hatched make a tent like a spider's web between the forks of the branches of apple and cherry

trees; they spin from the mouth a silken thread which serves to conduct them to the tent in their search for food, and in this manner their pathways become in time well car-



American Tent Caterpillar (*Climacampa Americana*).
a. Cocoon. b. Moth.

peted and secure. They are called lackeys in England, and *liérées* in France, from their parti-colored livery of white, black, and yellow. The American tent caterpillar or lackey (*clisiocampa Americana*) is so abundant and so well known as one of the worst enemies in the orchard, as to receive in many districts the name of "the caterpillar." The lappet moths are so called from the hairs which grow from fleshy or warty appendages that hang like legs from the sides of every ring; the American lappet moth is the *gastropacha Americana*, described in Dr. Harris's work above cited. The Chinese silkworm (*bombyx mori*), which belongs here, is noticed under SILKWORM, and the processionary moth (*B. processionnea*) under CATERPILLAR. 5. *Saturniada*, containing some of the largest and handsomest moths, with thick woolly bodies, widely feathered antennæ, and wings without bristles or hooks, and generally with a conspicuous spot in the middle of each; they fly during twilight. The most beautiful of all is the luna moth (*attacus luna*), with long-tailed wings of light green expanding $4\frac{1}{2}$ to $5\frac{1}{2}$ in., each having a transparent spot encircled with white, red, yellow, and black; the larva is bluish green, from 2 to 3 in. long, and when at rest nearly as thick as the thumb; it is found on walnut and hickory trees, and spins a strong cocoon within a cavity formed by the drawing together of a few leaves. The polyphemus moth expands 6 in., and is of a dull ochre yellow color, without tails to the wings. The *A. Cecropia* expands to $6\frac{1}{2}$ in., with rounded untail wings of a grizzled dusky brown, with a red eye spot with white centre and black edge. The *A. Promethea* expands to about 4 in. All these moths make very large cocoons entirely of silk, surpassing in strength those of the silkworm, and capable of being manufactured into very durable fabrics. Two other moths of this family, whose processionary larvæ are furnished with severely stinging prickles, are the *Saturnia Io*, expanding from $2\frac{1}{2}$ to $3\frac{1}{2}$ in., and the *S.*

Maia, resting like the former with the wings closed, expanding to about 3 in. 6. *Ceratocampa*, or horned caterpillars, being armed with thorny points, some of the anterior long and curved like horns; in the moths the short antennæ are feathered at the basal half and thence naked to the tip; the wings, closed when at rest, have no hooks nor bristles; this family, according to Harris, is exclusively American. One of the largest, rarest, and most magnificent is the royal walnut moth (*ceratocampa regalis*), expanding 5 or 6 in., the fore wings olive-colored with yellow spots and red lines, the hind wings orange red with yellow patches and olive spots; the horns of the formidable-looking larva are unable to wound. Other horned larvæ belong to the genus *dryocampa*, as the imperial moth (*D. imperialis*), with yellow wings sprinkled and spotted with purple brown, expanding to about 5 in. 7. *Zenzeradæ* or *hepialidæ*, whose larvæ are concealed in the wood and pith of plants like the borers of the hawk moths; these larvæ are whitish, soft, nearly naked, with horny heads, and 16 legs; they make imperfect cocoons. Here belong the ghost moth of Europe (*hepialus humuli*), very injurious to the hop vine; the famous *cossus ligniperda*, so destructive to the elm and willow; and various borers of the locust tree in this country, the carpenter moths of the genus *xyleutes* (Newman), which includes the *C. ligniperda*; the last are sometimes called goat moths from their strong odor. 8. *Psychadæ*, or sack-bearers, from the larvæ bearing about with them cases in which they live, made of bits of straw, leaves, and sticks, and lined with silk; they undergo their change within these; here belong the genera *psyche*, *actietus* (drop or basket worms), and *perophora*. 9. *Notodontadæ*, so called from the hunched or toothed back of the larvæ; some are naked, others slightly hairy, with 16 legs, of which the last pair are sometimes modified into a forked caudal appendage; some seem to be without legs, showing only the soles of the feet. Here belong the odd-shaped *limacodes* or slug caterpillars, found on forest and orchard trees; the *dicanura* or fork-tails, the last pair of legs being held upward; and the various species of the old genus *notodonta*, as the *N. unicornis* and *concinna*. II. *Noctua* or owlet moths, equivalent to the *noctualites* of Latreille, so called from their flying chiefly at night like owls. This tribe contains many thick-bodied and swift-flying moths, which generally have long and tapering antennæ, long tongue, distinct feelers, wings fastened by bristles and hooks and roofed when at rest; the colors are usually dull, and shades of gray or brown; the larvæ are for the most part naked, slow-moving, usually with 16 legs, and nearly cylindrical; some make cocoons, while others go into the ground to transform. Their injury to vegetation is considerable. Among them are the maple moths (*apateia*) of America and Europe; the nonagrians, like the spin-

dle worms; the agrotidians or rustic and dart moths and cut worms; and the mamestrians, like the zebra, painted, and wheat caterpillars, and cotton worms. III. *Geometra* or *phalænites* of Latreille, including the geometers, span worms, and loopers, so called from their manner of moving. The characters of this tribe are sufficiently given under CANKEE WORM. It contains the genus *phalæna*, which has been divided into many subgenera. IV. *Pyrallides* or delta moths (included in the *deltoides* and *tineites* of Latreille), nearly allied to the geometers, and so called from the triangular Δ form of the closed wing; the body is long and slender, the fore wings rather narrow and elongated, antennæ long and generally simple, and the legs slender; most of them fly by night, preferring moist localities. Here belong the meal moth (*pyralis farinalis*), the grease or tabby moth, the day-flying *simaethis* (remarkable for their gyrations after alighting), the aquatic *hydrocampa*, &c. (living in cylindrical leafy cases in the larva state), and the hop-vine *hypena*. V. *Tortricæ* or leaf-rollers, so named from the habit of most of their larvæ of making rolls of leaves fastened by silk, serving both for habitations and food; they have 16 legs, and are mostly naked. The moths rarely expand more than an inch, and carry their wings when at rest like a steep roof; the fore wings are very broad at the shoulders, and are generally prettily banded and spotted; the hind wings are plain; the antennæ thread-like, the tongue short, the body thick, and the legs short; they fly only at night, and are most abundant in midsummer. The bud caterpillars are frequently very injurious in orchards and flower gardens, fastening the tender leaves together and eating the substance of the bud, and some bore into and destroy young fruits; apricots, peaches, and plums often suffer much in this way. The turpentine moths pierce the tender shoots and terminal buds of the fir and pine trees, the seat of their depredations being indicated by the oozing of the resin. The moth of the apple worm (*carpocapsa pomonella*), which expands three fourths of an inch, may be known by a large oval brown spot, edged with copper, on the hinder margin of the fore wings; they lay their eggs on the young summer apples in July evenings, dropping them one by one in the hollow at the blossom end of the fruit; the larvæ are hatched in a few days, and at once burrow toward the centre, only one being commonly found in each fruit; it reaches the full size in about three weeks, by which time it has burrowed in various directions, getting rid of the refuse fragments by a hole which it gnaws in the side, through which it also escapes after the premature fall of the fruit; they make silken cocoons, and are not generally changed to moths till the following summer. Pears and cranberries are affected by a worm apparently the same as that of the apple. VI. *Tinea* (*tineites*, Latr.), the moths *par excellence* of the household, the

destroyers of clothing, carpets, furs, &c., and those referred to in the Scriptures and by the old writers. The larvæ are smooth, with 16 feet, living usually in cases made from the fragments of the substances which they devour fastened together with silk, in which they move freely and unseen. Though the smallest of the *lepidoptera*, they are among the most beautiful and the most destructive. Here belong, among the *crambida*, the bee or wax moth (*galleria cereana*), noticed under BEE; among the *tineæ*, the clothes moth (*tinea vestianella*), carpet moth (*T. tapetella*), fur moth (*T. pellionella*), hair moth (*T. crinella*), and grain moth (*T. granella*); and among the *ypomontada*, the pack moth (*anacamptis sarcitella*), destructive to wool and its fabrics, and the Angoumois grain moth (*butalis cerealella*). The best preventives against moths in household articles are to put them away before May or June where the moths cannot reach them when about to lay their eggs; to expose them to the air and sun for hours, after a good beating to dislodge any insects or eggs; to brush over their retreats with turpentine; to strew camphor, black pepper, tobacco, or shavings of Russia leather under or among carpets, woollens, furs, or feathers, when they are put away for the summer; the use of camphor wood or cedar trunks; corrosive sublimate washings, tobacco, and sulphur fumigations, and the action of heat and steam. For an account of the American and European grain moths, see WHEAT MOTH. VII. *Alucitæ* or feather-winged moths, equivalent to the *pterophorites* of Latreille. These may be known by the longitudinal division of their wings into narrow fringed branches like feathers; the antennæ are slender and tapering, the tongue long, the body and legs long and slender, the wings at rest not covering the body, but standing out like a folded fan; the flight is slow and feeble, sometimes diurnal, sometimes nocturnal; the larvæ are short and thick, slightly hairy, with 16 legs, living on leaves and flowers, and constructing no cases. There are few species, and they are rarely injurious to man.

MOTHE (or *Motte*) **CADILLAC.** See CADILLAC.

MOTHER CAREY'S CHICKEN. See PETREL.

MOTHER OF PEARL. See PEARL.

MOTHERWELL, William, a Scottish poet, born in Glasgow, Oct. 13, 1797, died there, Nov. 1, 1835. He was educated at the grammar school in Paisley, and at the age of 15 was placed in the office of the sheriff clerk of that place. He was sheriff clerk depute of the county of Renfrew from 1819 to 1829. In 1819 he edited the "Harp of Renfrewshire," a collection of songs and poems. In 1827 appeared his "Minstrelsy, Ancient and Modern," with an elaborate historical introduction and notes, and several original poems in antique guise. He edited for a year the "Paisley Magazine," and printed in it some of his best poems, and between 1828 and 1830 conducted the "Paisley Advertiser." In the latter year he took charge

of the "Glasgow Courier," a journal of very decided tory principles, with which he remained connected until his death. In 1832 he published "Narrative and Lyrical Poems," and soon after commenced in conjunction with James Hogg an annotated edition of Burns's works, which he did not live to complete. In 1849 a greatly enlarged edition of his poetical remains, accompanied by a memoir, was published in London. The heroine of his most famous poem, "Jeanie Morrison," a school-mate, did not know that it alluded to herself until years after its publication, when she was married to a Mr. Murdoch. Motherwell continually altered the poem as long as he lived.

MOTHERWORT (*Leonurus cardiaca*; Gr. *λέων*, a lion, and *οὐρά*, a tail), a plant belonging to the mint family or *labiate*. It is met with around walls, fences, and neglected spots near farms and gardens. The root is perennial, stem 2 to 5 ft. high, branching near the base, and downy;



Motherwort (*Leonurus cardiaca*).

leaves 2 to 4 in. long, lobed and broad, growing narrower toward the top of the stem, the uppermost wedge-shaped at base and three-cleft at the apex, all bending downward. The flowers are borne in many whorls; the calyx has rigid and prickly teeth; the corolla, hairy without, is pale purple; the nutlets containing the seeds are triquetrous and truncate at summit. Another species, *L. marrubiastrum*, has become partially naturalized in some districts of Pennsylvania; it is a tall biennial with oblong-ovate stem leaves and whiter flowers. The common motherwort has a strong, pungent odor, and a bitter taste, and, as its name indicates, has been used as a remedy in diseases of females, and at one time it acquired a reputation in Russia as a preventive of hydrophobia; at most it is an aromatic tonic, and its use is now confined to domestic practice.

MOTION. See MECHANICS.

MOTLEY, John Lothrop, an American historian, born in Dorchester, Mass., April 15, 1814.

He graduated at Harvard college in 1831, and spent a year at each of the universities of Göttingen and Berlin, after which he travelled in the south of Europe, chiefly in Italy. On his return to America he studied law, and was admitted to the bar in 1836, but he practised little. In 1839 he published a novel entitled "Morton's Hope, or the Memoirs of a Young Provincial." In 1840 he was appointed secretary of legation to the American embassy to Russia, and held the post for about eight months, when he resigned and returned to the United States. In 1849 he published "Merry Mount, a Romance of the Massachusetts Colony." Meanwhile he had contributed various articles to some of the leading reviews. About 1846 he began to collect materials for the history of Holland, writing enough to form two volumes; but, unable to find at home the authorities necessary for the thorough prosecution of the subject, he embarked for Europe with his family in 1851. Dissatisfied with his previous labors, he threw aside all he had written, and began his task anew. In Berlin, Dresden, and the Hague, he passed most of his time during the next five years in the composition of his history, "The Rise of the Dutch Republic" (3 vols. 8vo, London and New York, 1856). It was reprinted in English at Amsterdam, and was translated into Dutch under the supervision of the historian Bakhuizen van den Brink, who prefixed an introductory chapter. A German translation was published at Leipsic and Dresden; and a French translation, with an introduction by Guizot, was published in 1859 in Paris, and another in Brussels in 1859-'60. It was also translated into Russian. In 1860 Mr. Motley published the first two volumes of the second portion of the work, entitled "The History of the United Netherlands from the Death of William the Silent to the Twelve Years' Truce, 1609;" and in 1867 it was completed in two additional volumes. This was followed in 1874 by "The Life and Death of John of Barneveld, Advocate of Holland; with a View of the Primary Causes of the Thirty Years' War" (2 vols.). It is understood that Mr. Motley is engaged in writing a "History of the Thirty Years' War." He has been elected a member of various learned societies in Europe and America, among them of the institute of France in place of Mr. W. H. Prescott. In 1860 he received the degree of D. C. L. from the university of Oxford, and that of LL. D. from Harvard college. He has also received the degree of LL. D. from the university of Cambridge, England. In 1861 he published in the London "Times" a paper entitled "Causes of the American Civil War," and in 1868 delivered before the New York historical society an address on "Historic Progress and American Democracy." On Nov. 14, 1861, he was appointed minister to Austria, and resigned in 1867. On the accession of President Grant in 1869 he was appointed minister to England,

but was recalled in November, 1870, when he revisited Holland, and afterward went to England, where he still resides (1875).

MOTMOT (*momotus*, Briss.; *prionites*, Ill.), a genus of American fissirostral birds of the family of rollers and subfamily *momotinae*. The single genus is characterized by a bill rather long, slightly curved, with compressed sides, hooked and obtuse tip, and lateral margins serrated; wings moderate and rounded,



Brazilian Motmot (*M. Brasilensis*).

fourth to sixth quills nearly equal and longest; tail lengthened and graduated, with the two middle feathers usually longer than the others; tarsi as long as the middle toe, covered in front with narrow transverse scales; toes unequal, the outer nearly as long as the middle and united at the base as far as the second joint, the inner short and slightly united, the hind short and weak, and the claws compressed and

curved; the tongue is long and barbed as in the toucans. The name is derived from the peculiar notes. There are about a dozen species, bold and wild, inhabitants of tropical America and the West Indies, especially in the deep shades of the forests or gloomy recesses of old buildings; they are usually solitary in the daytime, perching with the head drawn between the shoulders; they are most lively at early morning and in the dusk of evening, pursuing insects in short flights; they also eat fruits, lizards, and snakes, which are tossed into the air from the point of the bill and swallowed; they sometimes devour the eggs of other birds. The nest is made in holes of trees or banks of earth. They are said to peck off the barbs from a portion of the stem of the central tail feathers, leaving a rounded feathered surface at the tip. The best known species is the Brazilian motmot (*M. Brasilensis*, Lath.), about the size of a blackbird, of a deep rich green color, with bluish forehead, violet back of head, and black crown. The movements are awkward on the ground.

MOTRIL, a town of Spain, in the province and 36 m. S. by E. of the city of Granada; pop. about 13,000. The streets are in a bad condition. The principal square contains the collegiate church and the town house. Among the other public buildings are chapels which formerly belonged to convents and a handsome church connected with a nunnery. The Mediterranean having receded about a mile, the port has been removed to Calahonda, 7 m. E. of the town, and to the roads of Baradero. The principal imports are rice, sugar, coal, and wine, and the exports comprise fruit, oil, wine, and lead. Fish and fruit are especially plentiful. There are many potteries and several sugar and other manufactories.

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